

# SUPPLEMENT.

## The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE: FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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### Original Correspondence.

#### THE MINERAL RESOURCES OF JAPAN.

There are in Japan several mining districts celebrated, and very properly so, among the Japanese. These are, among others less important, Ykouno, between the provinces of Tassima, Harima, and Tamba; and Sado, near Niegata, for gold and silver; Yamato, to the south of Osaka, for copper; and Sisso, in Harima, for iron. The province of Satsouma is reported to be exceedingly rich in metals. Ykouno is in the island of Nippon, about 25 leagues north-west of Osaka, at about equal distance from the two seas which wash the shores of Japan—that is, about 10 or 12 miles south of the Sea of Japan, and the same distance to the north of the ocean. It is a very mountainous country, with very narrow valleys, and the geological exploration of it is very difficult, for the sides of the mountains are inclined at least 50°, and covered to their summit with a thick layer of vegetable earth, clothed with a very dense vegetation. The district of Ykouno is formed of an enormous porphyritic eruption, in which the veins cross each other perpendicularly, those of copper running north and south, and those of gold and silver, east and west.

The great majority of the veins are uniquely formed of white crystalline quartz, in which quartz crystals are very rare. The silver in them is always in the state of black sulphide, absorbed into the quartz, and mixed with gold, but in what state the writer cannot say, for in fragments very rich in gold (that is, containing up to 5 percent.) the metal is invisible, not only with the ordinary lens, but also with the microscope magnifying 400 times. The gangue consists of white iron pyrites in very small crystals, copper pyrites, black jack, and a little galena. It is always in the neighbourhood of this mineral that the violet fluor-spar, which is so carefully collected by the Japanese silver melters, is met with. Two veins only contain proportions of carbonate of lime, but they are always very siliceous.

The Japanese are very good working miners, but were not acquainted with the use of gunpowder before Mr. Sevoz's arrival; they now handle it well enough, and there has been but one slight accident from its use. The workings are carried on as in Europe, and the principal level is provided with a railway. The treatment of the mineral is similar to that adopted at Freiberg—sorting, stamping (with 10 stamps of 3 cwt.), calcining in the reverberatory furnace, with the addition of salt and argentiferous pyrites, and then amalgamation in barrels in the presence of iron. The mean results of laboratory assays and of ore treated in the works during ten months showed—per ton of mineral before calcination—silver, 774 grammes; gold, 154 grammes. Per ton of calcined mineral, silver, 600 grammes; gold, 131 grammes. The percentage, therefore, is in the first case 83·4 silver and 16·6 gold; and in the second 82 silver and 18 gold. The amalgam pressed by hand in a felt or close linen contain 16 to 17 per cent. of fixed metals, or about one-sixth. The 10 stamps treat from 3 to 3½ tons of ore per day, and the average monthly production of ingots is about 1 cwt.; they consist of 13½ per cent. gold, 61 per cent. of silver, and 25½ per cent. of copper. The precious metals are, therefore, in the proportion of about 82 of silver to 18 of gold. Carefully sorting the richer portions of the mineral, the writer found it to contain iron pyrites, 26; copper pyrites, 22·7; blende, 9·4; sulphide of silver, 4·8; gold (probably native), 4·4; and quartz, 32·7 per cent. The specific gravity of the mineral was 3·7. The ordinary calcined mineral gave him 0·35 per cent. of silver in the state of chloride, and the same percentage in the state of sulphate. He assayed the numerous veins of Ykouno for precious metals. The iron pyrites gave 300 to 350 grammes of silver to the 100 kilos. The copper pyrites contains as much as 1·28 of silver per 100 kilos of copper, but only traces of gold. The blackjack gave 275 grammes of silver to the 1000 kilos, and no gold. And, lastly, the galena is the poorest in silver, as it only contains 54 grammes to the 100 kilos of lead.

For many years the Japanese have smelted ores at Ykouno for silver and copper, and, consequently, there are large quantities of slag which could be re-melted with profit; they contain 533 grammes of silver and 83 grammes of gold to the ton. The Sado Mine, judging from samples received, yields ore giving about equal quantities of gold and silver; but ingots sent from this mine to Jeddo contain—gold, 3½; silver, 65½; and copper, 31½ per cent. At Sado the ore is amalgamated without previous calcination, which seems to justify the belief that the gold does not exist in a native state. It will thus be seen that Japan is rich in precious metals, but that these metals do not occur in masses, but, on the contrary, are very much disseminated in excessively hard rock, and that the Japanese, if they would place the mines in the hands of Europeans, which is very doubtful, would not influence the markets of the world, as has often been stated.

The metal which is really abundant in Japan is copper. In almost every province numerous rich veins, often argentiferous, of copper pyrites are found, but working on a large scale is dependent on the making of roads and the canalisation of certain rivers, which works are only carried on at a very slow rate. At 4 or 5 leagues around Ykouno the yellow micaceous granites reappear, which are seen on the southern coast of the island. These granites are intact in some parts; in others they are decomposed into a sort of kaolin; and in still others they are easy to disintegrate, and contain grains of iron ore. These ferruginous grains are almost identical with those noticed by Mr. Domeyko on the coasts of Chili, and washed by the sea. Mr. Sevoz did not make a complete analysis, but has no doubt they are oxidised titaniferous iron; they contain 90·3 per cent., acted upon by the magnet, and 9·7 not so acted upon, but which are very rich in titanate acid. As washed by the Japanese smelters the ore assays, by the dry way, 61½ per cent. of metallic iron. It would be easy to concentrate it by dressing more carefully, but the smelters find it advantageous to leave in a little of the quartz and felspar to serve as flux. The mode of treatment adopted is a sort of imperfect Catalan method. The slags contain more than 40 per cent. of iron, and only 26 per cent. is extracted from the ore, the metal being half iron and half steel, which requires much manipulation to make it marketable. That which distinguishes the Japanese method from that of Ariego is that they treat at a single operation nearly 1½ tons of ore, which furnishes a long mass of metal, weighing about 1½ ton, which is broken up for subsequent treatment under a hammer, raised by a wheel, about 12 yards diameter, worked by men. The composition of the slag is—silica, 26·50; alumina, 8·37; oxide of

iron, 62·25; lime, 1·75; alkali, 2·13—101. Charcoal costs from 6s. 6d. to 7s. per ton, and ore about 8s. per cwt. At the conclusion of his visit to the mine, Mr. Sevoz made a report to the Government, the conclusion drawn in which was that by means of a small blast-furnace and a few Comtoise hearths they might easily, estimating all plant and material, and allowing for the repayment of the capital in five years, produce very good iron at 4s. per cwt., or one-half the present price.

#### CAPITAL VERSUS LABOUR.

The long-continued agitation between capital and labour cannot but produce a most injurious effect upon every department of trade and commerce. The practical solution of the various difficulties has been a question which has long puzzled the most astute political and social reformers, and now sorely perplexes those most anxious for a satisfactory settlement, and whose welfare is most intimately concerned. One thing we may safely venture to assert, and that is that so long as the interests of each are considered antagonistic—so long as the employed look upon their employers as "robbers" and "spoliators" (as some of the paid agitators of the Unions have denounced them), and so long as the masters are not prepared to concede the full advantages of the present prosperous times to their workmen, so long will these trade agitations continue, and capital and labour be at war. As the interests of both are identical, mutual concessions should be made on both sides;—the workmen should repose confidence in their employers, and this confidence should not be misplaced. Until all trade relationships are carried on upon such principles as these, neither party can expect any permanent exemption from the vexatious questions which now occupy them, and which tend to throw all commercial connections out of gear, to the manifest disadvantage of all.

The iron and coal trades and the whole manufacturing industries of the kingdom are at the present moment in a state of almost unprecedented activity. The mills and forges are being pushed to their full limit. Works are being extended in all directions, and new ones are cropping up with almost mushroom rapidity. The make of iron and steel and the yield of coal were never so large as at the present moment, and never before have prices reached the present quotations. Labour was never in greater demand, and everyone ready and willing to work can obtain it at wages which in the days of our forefathers would have been considered fabulously high. Whither is all this tending—is this the feverish excitement which precedes another speculative mania? We are rather afraid we are drifting in this direction. Gigantic schemes are heralded before the world, which are so many tempting baits to capitalists, and tend to allure from the safer and more legitimate development and expansion of well-known and older established works and mines. In the midst of all this rush after wealth—this undue haste to be rich—paid agitators have entered a campaign against capital, stirring up agitations and "strikes" most inimical to the interests of all. Not only in England, but in Germany, in France, throughout the Continent, and in America, there is such a spontaneity of action on the part of the working men as to induce the belief that there is one great centre of mischief, and to give colour to the assertion that most of these trade agitations have their origin in the *Société Internationale* in France and Germany, with a strong and well-organised branch, known as the International Society, in London. The pity is that the working men generally fail to see that these ever-aggressive movements take their inspirations from paid agitators, and continue their progress by means of demagogues who have no interest but those of their own ease and aggrandizement, and for these would readily sacrifice the material welfare of both employed and employer. So long, therefore, as the mechanic, the artisan, and the workmen generally will listen to the ravings of the directors of these pernicious societies, rather than accept the friendly counsel and advice of their employers, so long, we are afraid, there will be constant disturbances between employer and employed, and the war between capital and labour be carried on with severity.

One thing can scarcely be too strongly impressed upon the minds of the working classes, and that is that these persistent and continued demands for shorter hours of labour and increased rates of pay are forcing up provisions and the whole necessities of life to an unprecedented extent, and such as must sooner or later bring about a strong reaction. It is beginning to dawn upon the minds of the working classes that the cost of living is proportionately higher than the increase of wages, and that dearthness is not altogether consequent upon scarcity, but also upon higher wages paid in every department. The importation of articles of manufacture from the Continent has also set in upon a scale of such magnitude as must eventually produce serious consequences in our own marts of industry if permitted to continue, and wages will be reduced to an extent of which the artisan has now no notion. These continual struggles between capital and labour, therefore, cannot but be condemned upon every issue. They prevent the legitimate employment of capital in taking contracts, and are driving work which ought to fill our factories and workshops to other nations; whilst on the other hand the interested motives of the Trades Unionists are producing results to the working classes which altogether out-proportion the increased wages and the shorter hours of labour obtained.

We cannot pretend to point out a practical solution for the vexed question of how to obtain a permanent peace between capital and labour. The various Trades Unions have now such strong and well-organised ramifications throughout the country, that the working men have things petty much in their own hands, so much so that they have indignantly refused arbitration. Whether the rapidly growing co-operative movement, whereby the working man has a direct interest in the prosperity and profits of the works, will solve the problem remains to be seen; and time can only answer whether the gordian knot can be unravelled by a fixed rate of wages being paid when iron, coal, and other articles of staple manufacture shall command fixed prices. One thing, however, appears quite clear, and that is that the present feverish excitement amongst all classes of manufactures and commercial undertakings is unhealthy, and cannot, therefore, be of any permanent duration. And with only a partial cessation in the present unparalleled demand for our staple articles of manufacture, wages will find their level. The laws which govern the relations between supply and demand—also between capital and labour—are immutable, and can be no more influenced by

combinations of men or Trades Unions than the ebb and flow of the tide. If, then, the men would be counselled, if they would desire to enhance their own interests, and place trade and commerce upon a firmer foundation, they would refuse to be influenced by paid agitators whose only interest is to stir up strife between employer and employed. We have suffered enough from the speculative mania in times past. We would fain see the present feverish excitement allayed, for we cannot think it wholesome or healthy. We sound a warning to both—to capitalists and manufacturers we would say there are highly remunerative fields of enterprise open for the legitimate employment of capital without rushing into speculations which have no solid foundations; whilst to the operative and artisan we would say that there must be a turn in the ever progressive rate of wages. We want to avoid the ruinous consequences of another commercial mania and crash, and desire to see our staple trades based upon a solid, permanent foundation. That can never be the case so long as there is a reckless speculation, or so long as there is war between capital and labour. Mutual confidence between employer and employed is the only safeguard, and the only solution of the problem which now engages the attention of all.

#### THE NORTH OF IRELAND COAL FIELDS.

The increased cost of coal, and especially in Ireland, renders all information that can be obtained about our own coal fields more than ever interesting; and as nothing like a satisfactory account of the Tyrone coal district has yet appeared some minute details might not prove unacceptable. Nothing more definite can be elicited than that coal was first discovered in the Coal Island district by Bishop Ryder, about a century and a half ago, and some years later in the Annahone district. The Coal Island district is over six miles in length from west to east, and has an average breadth of fully two miles. The earliest instance known of the working of coal was in 1779, when Mr. Ducart, an Italian engineer, opened four pits in the townland of Derry, which were ultimately closed. There are at present in the immediate neighbourhood of Coal Island over 20 pits, exclusive of two at Greenagh, but in two of these coal is not now obtained, for all the beds yet reached are exhausted. Fire-clay is extracted instead, but in time coal may be expected to be reached again, as the best seam known in the district has not yet been reached; and one, which is situated in a hollow, is not more than 38 yards in depth. The Annagher measures, which are nearest to Coal Island, contain four distinct seams, independent of the irregular surface coal, which is valueless because of its impurity. The nearest to the surface is the Annagher coal, which is about 48 yards from the surface where farthest from it, but in some places less than 15. The seam is usually 9 feet in thickness, being the thickest yet worked. Between the Annagher and Bracknagh measures there is to be found, at about 20 yards lower than this 9-foot coal, a variety which occurs in beds of about 4 feet thick and a few yards in extent, which very much resembles in appearance and quality the best Orrel. The next bed below the Annagher coal is the bone coal, but which is not spread over the whole extent. Its distance below the Annagher varies from 25 to 10 yards, the average being about 18. The bed below the bone coal is the shining seam, so called from its exceptionally brilliant lustre. It is far from being pure, containing many earthy metallic ores and other substances. The next lower bed, the 5-foot coal, as it is usually called, is a very valuable one, being of great density, and lasting much longer than Scotch coal. Its thickness is uniformly 5 feet, and it is the only bed which is supposed to extend continuously and uniformly through the whole coal district. Below it, the Baltibay coal, which is still denser, has often been found in experimental borings, but it has not yet been worked in Annagher. At the lowest point or dip of the beds, in a hollow, the Baltibay coal was discovered at a depth of from 115 to 140 yards, and of a thickness far exceeding what has been found elsewhere. It has been pierced to the depth of 16 feet, without reaching any other deposit. This coal is, according to the miners, far the best in Ireland at this depth. (But according to other authorities there is much better to be found, and that in far greater abundance, at a high level on the mountain of Slieve-a-Neerin, or the Iron Mountain. This mountain is situated near Carrick-on-Shannon, close to Lough Allen, and contains certainly coal and iron, and it is supposed lead also.) Below the Baltibay coal no borer has yet penetrated in the Annagher district; but it is easy to glean from what has been stated that there is room for much greater activity in raising coal than has yet been displayed. Independently of the fact that in many of the coal districts there are no pits at all, none yet sunk has gone to the lowest depth that would yield a profitable return. It is certain that the Tyrone coal, while superior to any of the Scotch coals, could be supplied in Belfast at a much lower cost.

#### COAL IN ANGLESEY.

SIR,—Now that coal is such an important item, I wish to direct the attention of capitalists to the fact that an easily-worked seam, 5 ft. thick, runs through a portion of Anglesey. Two poor men, I am told, raised 1000 tons some years ago with only a small engine drawn by a donkey. I shall be glad to give any information required.

Aug. 19. ANTHRACITE.

[We shall be glad if our Correspondent will furnish such information as he may possess, which will prove of much interest to many of our readers.]

#### THE PREMIUM OF TWENTY POUNDS FOR ESSAYS ON MINING MACHINERY.

SIR,—We are competing for the prize offered by one of your correspondents for the best account of mining machinery and tools. As the requirements of the Essay are, in our opinion, rather indefinitely stated, we shall be greatly obliged by your obtaining for us answers to the following:—

- 1.—Must the Essay treat on foreign or British machinery and tools, or both?
  - 2.—Whether general or metalliferous mining; if the former, whether quarrying must be included?
  - 3.—Are sketches expected?
  - 4.—The maximum time allowed?
- Answers to these questions will enable us to judge of the nature of



the information which your correspondent requires. We shall be glad to have any further instructions which he may deem requisite for our guidance in the matter. T. H. LETCHER AND S. MICHELL, St. Day, Cornwall, Aug. 17.

[We forwarded this letter to our Correspondent, who states, in reply, that—as the information is intended for the benefit of our home mining interest, the Essay should treat only on British Machinery and Tools; that general mining was intended, and quarrying should be included; sketches are not required; and that the time will be stated by Mr. Collins.]

#### PNEUMATIC STAMPS.

Sir,—It will probably be interesting to your readers to hear that the Pneumatic Stamps at Wheal Lucy continue to work most effectively. On July 18 Messrs. Eustice and Son reported as follows:—

Wheal Lucy, July 18.—The pneumatic stamps commenced working here on April 9, and have since that time been regularly at work on an average ten hours per day (Sundays excepted), and its working throughout has been in every respect satisfactory. The quantity it is capable of stamping we find to be about 10 tons per head in 24 hours, of quite equal hardness to the average of the county. Each head when new (without lifter, &c.) weighs 84 lbs., and was last week for the third time replaced by a new one. Presuming that those now in use are one-third part worn, we find the total amount of metal used per head for the 3½ months (working ten hours per day only) to be 280 lbs., but as these heads were changed when two-fifths only of the original weight were worn off, the actual amount of metal worn would be 112 lbs. We have not had an accident of any kind, and we may safely say no let or hindrance on account of the stamps to the extent of six hours during the whole working. We have recently had it taken apart for the purpose of examining it, and ascertaining whether the bearings or any of the working parts showed any signs of undue wear, but we could not discover any. Viewing the question as to the desirability or otherwise of erecting the pneumatic stamps, as compared with those ordinarily used, we cannot but come to the conclusion that to do an equal amount of work the first cost of the pneumatic stamps, and the time required for erecting it, will be much less than with the ordinary ones. That the cost of fuel in working and the expense of keeping in repair will be also less. Having carefully watched its working, and given the matter that consideration which one of such importance requires, we are of opinion that for effective working, economy, and durability, it is superior to any stamps we have seen.—GEORGE EUSTICE AND SON, Engineers.

[This report appeared in the Mining Journal of July 20.] Since that date the stamps have been at work continuously, except for a few days for want of water, and during the last fortnight have been stamping through the finest grates used in the county of Cornwall, as the tin is of very fine grain. The quantity stamped is quite equal to that reported above—about 20 tons in 24 hours' stamping with the two heads.

By indicator diagrams taken at Wheal Lucy the power required (notwithstanding the friction of a train of wheels, which under ordinary circumstances will not be required) is not in excess of two-thirds that which would be required to stamp the same amount of tinstuff by the old method; or, in other words, not more than two-thirds the fuel consumed by the old stamps is required. With respect to wear and tear, it is found that up to this date the stamps continue in perfect working order. Miners will also appreciate the fact that the tin stamped is retained more at the head of the strips than by the old method, and a much smaller proportion of the tin is carried off in the slimes.

Other stamps on the same principle will soon be at work in other mines in Cornwall. I have been induced to send you these facts, which can be verified by reference to the agents of the mine, to refute certain misleading remarks made at a public meeting.

Hayle, Aug. 20.

H. W.

#### THE FORTESCUE TIN MINE—ST. STEPHEN'S-IN-BRAMWELL, CORNWALL.

Sir,—The adventurers will, I have no doubt, be pleased to know how matters progress at the mine, and hear from me from time to time respecting its development. It is my wish to advise every shareholder, and to furnish him with any information he may require at any time, and it shall be my endeavour to render him conversant with the proceedings at the mine, so that he may always know the worth of his shares. As the shareholder is proprietor, so should he know the intrinsic value of his property, and what is being done with it. As far as appearances justify an opinion respecting Fortescue, we have every prospect of soon laying open a great mine. Its position geologically and physically is all that can be desired, and the development of its lodes demonstrate what has been previously said as to its yield and value.

The lodes at every point of operation are highly productive; they are large and well defined. For distinction they are known as Hardhead lode, James's north lode, Hosken's lode, James's lode, Phillips' branches, east caunter, middle caunter, and west caunter. All the lodes except the former, and a small one known as Marshall lode, run near each other, and can be easily commanded for development by short cross-cuts from one to the other; but Hardhead lode is 100 fms. to the north of these lodes; it must, therefore, be developed separately, and the water pumped by aid of flat-roads. Its dip or declination is so gentle, and the configuration of the sett is such that I find it advisable to sink the flat-rod shaft on its course; this shaft is now from 4 to 5 fms. deep. The main engine-shaft will be to the north of the other lodes; it will be sunk perpendicularly from the best known point, and cross-cuts driven south to intersect the lodes, and then levels will be driven east and west on the course of the lode, as may be deemed desirable. It is a matter of great importance to determine as to the position of an engine-shaft, and to the erection of stamping-mills, in erecting dressing apparatus, &c.

I have purchased a powerful steam stamping-engine, such a one as advised by Captain Pope in his last report. The rotary gear is new, has never worked, and the internal parts quite equal to new. "This came to me a bargain," for little more than one-half the price of new, and is quite equal to new. This engine is to be a permanent stamping-engine. The site of erection is on a beautiful slope for laying out dressing-floors, and is of good length, which are features of no mean importance. This engine will also pump water for some time—i.e., until we want a separate pumping-engine.

J. HARRIS-JAMES, M.E.,

Grampound-road, Cornwall, Aug. 21.

Managing Director.

#### WHAT TO SELECT—WHAT TO AVOID—No. XXV.

Sir,—In last week's letter the writer strenuously advised those of your readers who invest capital in mines to adopt the recommendations he gave last autumn, by availing themselves of the present opportunity to make a selection of sound dividend and progressive home mines, adding that as a somewhat sharp reaction had occurred in the metal market, and mining values declined, another period had come about, which may be truly designated the investor's opportunity. Scarcely had this advice appeared in your columns than a material advance was announced in the price of copper, while the general aspect of the tin market so much improved as to arrest, at least, any further decline in price, if not to indicate an advance. From reliable sources the writer feels himself perfectly justified in stating that the value of both tin and copper will be fully maintained, which, to say nothing of a probable improvement, is sufficiently remunerative to enable mines to return large dividends.

Among Cornish mines the writer would beg to direct particular attention to Tincroft, paying 2½. 2s. 6d. per share quarterly, the price being 60s. to 65s., the reserves in the mine representing considerably more than the aggregate market value. Dolcoath, paying 1½. 1s. 6d. bi-monthly, selling at 75s.; Carn Brea, paying 4s. quarterly, selling at 170s. to 175s. 10s.; and Cook's Kitchen, paying 1s. quarterly, selling at 30s.

BULLER.—The market value of these shares has nominally declined, without any actual transactions having taken place. The mine may fairly be stated to be in a much more encouraging position than for a long time past. The prospects for tin has considerably improved, especially at the most material point in the mine—at the bottom of Hocking's shaft; while the prospects for copper in the new shaft improve daily. If there be any truth in the theory of parallelisms, this new shaft is destined to open up an enormous deposit of rich copper ore, for it should be remembered that opposite this shaft, upon a parallel lode, copper ore to the value of something like a quarter of a million was returned.

SOUTH AURORA.—It may be in the recollection of your readers that the writer mentioned some months since that this mine, being situated between the Eberhardt and North Aurora Mines, cannot fail

to contain the rich deposits of silver ore which those mines returned some three years since, the assay value having been something like \$19,000 per ton. The writer at the time mentioned that those rich deposits would, in all probability, be found in the lower strata, as it could not be conceived that the superficial boundaries of the two contiguous mines had interfered with the intermediate mine (South Aurora), containing the same rich deposits. The importance and value of these remarks now become the more apparent from the fact that a diamond drill is in active operation, with appliances for boring to a depth of 665 feet. Long before this depth has been tested it is confidently believed that important discoveries will be made. The writer deems it prudent to make this fact known, as several attempts are being made to induce bona fide holders to part with their shares at the present depreciated price.

FLAGSTAFF.—This mine is opening out second to none in the Utah district, and in this statement the writer does not exclude the far-famed Emma Mine. The present furnace power is altogether unequalled to the producing capabilities of the mine, while the quality of the ore continuously improves in depth. The statement of the manager, to the effect that before the end of the year he will be able to return a net profit of more than 1000s. per day, is confirmed by accredited authorities, and seeing that with one furnace alone a profit of 500s. per day is being realised, enabling the directors to pay dividends at the rate of 24 per cent. per annum, the shares at current prices may fairly be regarded as among the cheapest in the list of foreign dividend-paying mines.

DON PEDRO.—The writer regrets to find that the unfavourable remarks made last week in reference to this mine have given grave offence in certain quarters, but their truth has since been shown by the report issued in the early part of the present week, wherein it was stated that the costs for the month had amounted to over 3000s., resulting in a net loss of 1500s. The writer is in a position to state most positively that Don Pedro is only just entering upon its career of serious outlay in excess of the returns, which must of necessity remain without any amelioration for many months to come. Not only will the whole of the reserve fund be absorbed, but calls will be imperatively necessary to complete the permanent pumping machinery. These will be found to be the true facts of the case, which in justice to the shareholders should have emanated from other sources.

FREDK. WM. MANSELL.

Pinner's Hall, Old Broad-street.

P.S.—The upward reaction which the writer last week anticipated would shortly ensue has already set in, large orders for most of the leading foreign and home mines being almost hourly received in the market. As soon as buyers appear the scarcity of stock becomes apparent, proving beyond a doubt that in a few weeks hence values will be more than re-established—therefore no time should be lost in selecting mines for investment.

#### MINING IN CORNWALL—MR. ENNOR AT ST. TEATH.

Sir,—You are aware that I have ever been a friend to legitimate mining. I abhor flash reports, and such as I see a deal of now in circulation, with their claims of thousands for a division among the promoters for work said to be done. I am only surprised that simpletons are to be found to join such visionary schemes. Over one-half the new things brought out are of this class; and singular as it is, these visionary, or I may say swindling tricks, are caught up first in preference to cheap and legitimate sets. I would not take shares at a gift in half of the things I now see shown off to the public. I may remark that I have lived in the parish of St. Teath occasionally over 60 years; through that time I have surveyed my full share of mines, at home and abroad. In the adjoining parish a mine has been worked by a first-rate company for about 40 years; they stuck to it like leeches, and I think raised about 16,000s. worth of ore. They sunk to about a 130 fm. level in very hard granite. I had orders three times to examine it and report upon it; but I was unfortunate—I found no copper there. These were the only three times I was ever in the parish. The mine has been abandoned for some years; but parties have been rummaging the burrows ever since for ore to be found in them. I might say that the mine was worked from the commencement to the end as what working miners term a "peepit" mine; they had two shafts very deep, and sunk the mine a fair depth, but they threw out no levels to prove any ground but what they were sinking in, and that was so dreadfully hard that they paid on or about 70s. per fathom for sinking it. Just close on it they drove some 8 or 10 fms. east, when they came into a beautiful channel of ground, that was driven for about 4s. per fathom. One of the men said he broke stones of copper in this end as large as his shoe on the last day he worked; but the orders came to stop, the funds were exhausted. This mine is a good specimen to mine agents, it shows the impropriety of sinking "peepit" mines; had they thrown out only a single level it would have shown them that they could have sunk the shaft for from 10s. to 20s. per fathom a few fathoms east in a beautiful channel of ground; these things caused practical miners to talk loud about it, and it is harrowed up by them to every passer-by. Many parties come and look at it, but the money spent by the last parties to make a pattern "peepit" mine of it scares them all off.

The last, or present, party is got up by Captain Dunn, from Tavistock. I never called to see what they were doing, but I was lately at Tavistock, when a Mr. Williams informed me that they had as fine a gossan lode there as he ever saw, but it was not the one worked on by the former parties. I could scarcely credit what he said, and on my return to St. Teath I was driven over to see it, on the 12th of the present month, and now in all my long career of mine surveying was I so surprised as I was to see what I did then. I will return to this again next week, and conclude here by saying it is a new maiden lode, never opened before. But to those inclined to venture in mines I say go at once, and see for yourselves. Take practical men with you, and you will see a second Devon Consols in every respect; but the ore there is the gossan burrow—I may say two gossan burrows—with the lode only opened to about 6 fathoms deep.

St. Teath, Aug. 20.

N. ENNOR.

#### THE SCIENCE OF INVESTMENT.

Sir,—The failure or success of joint-stock partnerships rests almost solely upon the directors displaying that earnestness and individual application to the administration of the affairs committed to their charge which would win, or have already won, success and reputation in their private ventures—the same diligence, vigilance, forethought, and economy which are everywhere the conditions of mercantile success. Men, it is said, rarely work when they have only a limited interest as they will work when they have everything to gain. There are doubtless many companies admirably administered by directors whose labour is unsparring and unceasing, and who have obtained for the enterprises under their control the success which their merits deserved. But examples of the opposite kind have been too frequent not to engender doubts in the integrity of boards and in the soundness of the system as a whole. We have been startled by some appalling catastrophes among the joint-stock banking and financial establishments of both the metropolis and the provinces. Again, the rottenness of the method upon which a portion of the insurance business of the nation was conducted was revealed, and lamentable are the conclusions to be drawn. To a similar or greater degree the crisis will arise in railway administration; and can it be predicted that they will emerge more triumphantly from the ordeal than joint-stock banking and financial concerns or assurance companies? The revelations of the Metropolitan Railway would go far to establish the contrary. It is not so much that the facts disclosed are scandalous and alarming, as that they testify to a culpable laxity pervading the whole system—absence of practical supervision.

It must be admitted, however, that many of our banks are unlimited, and those have attained the greatest altitude of success, as may be instanced in the prosperous growth of the business of each and all of the following banks:—London and Westminster, National Provincial of England, London and County, Union of London, and London Joint Stock. These five banks are managed by boards of directors, and no one can fairly question the integrity, zeal, and healthy character of the several executives connected therewith; but, again, the limited liability is not so successful when applied to joint-stock banking, as may be instanced by a reference to numerous undertakings that have at present to grope amongst the speculative instead of the ascertained and defined successes of the day.

As regards our National Debt (say) 800,000,000s. Three per Cent. Consols, at 93, yields the investor 3½ per cent. interest; landed estates, of first character and cultivation, are saleable at 32 to 34, and even 36 years purchase—so that our national indebtedness is on a par with the soils we inherit. There is no fear of political changes, of domestic conflicts, or of party subversion, ending in Republican repudiation of the National Debt. Again, every Englishman echoes the sentiment that "Britons, Britons ever will be free;" hence there is no fear that our island will again ever be successfully invaded by a foreigner. Consols and freehold lands are estimated alike, and both yield about 3½ per cent. interest, being very justly regarded as the safest securities that the world offers.

In respect to foreign Government stocks, issued in scrip or bonds,

which may be regarded as so many promissory notes of the several countries, the holders in England possess no tangible security, or hence their value ranks in accordance with public confidence in the integrity, honour, and capacity of the powers to pay. Thus, Brazil stands at 5 1-16 per cent.; Chili, 5 1-16; Russia, 5½; while French Six per Cents., 1870, is selling only at par, and consequently is estimated at a lower standard than any of the former countries. Argentine and Japan each return 6½. 6s. 3d. per cent.; Costa Rica, at 6½; Egypt, 7½. 15s., 6d. 18s. 9d., 8s. 15s., 7½. 16s. 3d., and 8s. 15s.; Paraguay pays 9½. 18s. 9d.; Peru, 7½. 16s. 3d.; Portuguese, 7½. 2s. 6d.; Spanish Three per Cents., 10½. 2s. 6d. per cent.; Turkish Five per Cents., 1865, 9½. 2s. 6d.; ditto "Mutton" Six per Cents., 8½. 13s. 9d., and ditto Six per Cents., 1869, 9½. 7s. 6d. per cent.; and, lastly, Uruguay Six per Cents., 1871, yields interest of 8½. 2s. 6d., while Honduras Ten per Cents., introduced in 1870, sells at 50 per cent. discount, and consequently pays 20 per cent. interest to purchasers.

In Cornwall there is a great prejudice existing to the adoption of the limited liability system, and in favour of the cost-book, which is a complete co-partnership; and although in many instances there are committees to supervise the management, yet the control is virtually and practically vested in the hands of shareholders, who meet two-monthly or quarterly upon the mines, and discuss the *modus operandi* of the past and direct the future operations, until again met together in open convocation. The position and prospects of the works are thus ascertained, the true state of the accounts determined, the balance *pro* or *con* struck, and a dividend declared or a call made, in accordance with the gains or losses then and there audited and established. This system has been carried out with wonderful success in times past, and the best mines that Cornwall now possesses are so constituted and conducted. Is it true that Boscawen Down is an example in favour of the limited liability principle, but then the extensive works were carried out under the Cost-book System; and while we congratulate the proprietors on the first dividend of 8 per cent., we cannot but recognise the advantages which they inherit from their predecessors.

The following statistics are applicable to twenty Cornish tin, copper, and lead mines:—

Dividends paid.	Mines.	Capital called up.	Total dividends declared.	Total market value.	Aggregate divs. and mkt. value.	Last dividend.
3 months.	Botallack .....	£18,200	£122,950	£50,000	£172,950	£8 per 40s
2 "	Basset .....	2,624	324,144	60,000	384,144	"
3 "	Buller .....	23,168	250,000	15,000	265,000	1 per 112
3 months.	Cook's Kitchen .....	29,600	26,276	74,000	100,276	1 " 240s
2 "	Carn Brea .....	35,000	298,000	167,500	465,500	4 " 100s
3 "	Dolcoath .....	46,145	409,015	300,000	709,015	1½ " 400s
4 "	East Caradon .....	15,742	101,965	30,720	132,685	3s. " 614s
4 "	East Pool .....	5,146	62,480	115,500	183,126	5s. " 640s
3 "	Herodfoot .....	8,704	63,976	27,448	91,424	3s. " 102s
3 "	Margaret .....	12,422	73,593	16,000	89,593	10s. " 112s
3 "	Mary Ann .....	10,240	75,264	10,500	85,764	5s. " 112s
3 "	Nth. Roskear .....	45,500	109,900	17,000	126,900	10s. " 112s
3 months.	Providence .....	11,488	116,480	31,360	147,840	10s. " 112s
2 "	Phoenix .....	25,000	238,750	100,000	338,750	11s 6d 600s
2 months.	Sth. Caradon .....	640	352,512	125,000	477,512	" " 612
2 "	South Frances .....	9,393	165,830	15,000	180,830	March, '69
3 "	Tincroft .....	54,000	233,550	340,000	573,550	42s 6d 600s
3 "	Trumpet Cons. .....	23,000	56,200	70,000	129,200	10s. " 400s
2 "	West Basset .....	18,000	135,000	53,000	190,000	18s 6d 60s
2 "	West Seton .....	19,000	230,600	27,500	258,100	40s per 40s
Totals .....		£412,012	£3,466,485	£1,648,428	£5,114,923	

\* Low computation.

The capital paid up on these 20 mines, all of which are conducted upon the Cost-book System, amounts to 412,012s.; when compared with the market value and gross dividends we have a sum of 5,114,913s. The expenditure has been secured to the enterprising adventurers over twelve times—the exact figures being 1241 per cent. Tincroft and Dolcoath, computing from the last-declared dividends, are respectively paying 51,000s. and 48,330s. yearly—say, 24½ per cent. annually—on the aggregate expenditure on the whole 20 mines. No one can seriously question that the value of money has declined. We may differ as to the cause, but the change cannot be doubted. Money will not buy as much of butchers' meat, of coals, of iron, and other common metals of manual and domestic labour as it did 20 or even 10 years ago. The course of the depreciation of money has been, on the whole, steady and progressive, and it is now stated by Professor Fawcett that prices of consumptive articles have risen from 40 to 50 per cent. since the year 1850. The gold discoveries in California had just been made at that date, and those of Australia were then unknown, so that the rise in prices has been simultaneous with the development of gold mining in the opposite hemisphere.

Twenty years ago there was a great inequality in the remuneration of labour in England and America, which produced a continuous migration from one to the other, and has since been fully maintained; hence the discovery of gold has unquestionably tended greatly to its depreciation in comparison with the necessities of life and the requirements of manufacture, trade, and of commerce. But I attribute the change and the urgency of the recent rise to another cause. The development of steam navigation has brought into close connection with ourselves countries very much in arrears in the economy of labour. Our ships trade with nations which have no roads, which possess no manufactures, and know nothing but the rudest processes of agriculture.

The advantages which can be secured in these countries by the making of roads, especially railroads, are such that their Government can afford to pay 8 to 10 per cent. to the capitalists who will make them, and machinery of all kinds is greedily sought after. Hence an enormous increase to our iron trade, which has produced a corresponding increase in the demand for coal, and the activity of these staple manufactures has passed through all classes of producers. Such immense and sudden changes and developments as are now experienced between capital and labour almost constitute them laws of natural progress, and tend to revolutionise the world, as did gunpowder, printing, coal, steam, iron, cotton, railways, the electric wire, and for the past twenty years the gold discoveries; but if matters go on with us as they lately have, the question before us is simple enough.

Either capital, enterprise, and skill will go where labour is to be found, or the superabundant labour of other countries will find its way here and become utilised. China, Japan, and India possess both coal and iron, and these countries possess fully one-third of the population of the earth. Combinations of working men can drive capital and skill from this country to either or all of the three countries named; their number of labourers is legion, their nature child-like and tractable, equal to all the lower functions of industry, eager for them, and long trained to denial, endurance, submission, and toil. If our men on strike do not know these facts it is because they have been so engaged in their petty class struggles as to have shut their eyes to the great current of human affairs. But that China, Japan, and perhaps India too, have to play a very great part in the affairs of the world is a matter already understood in America and our own colonies, and must necessarily soon be so at home. It should also be noted that the gains accruing at present are not attributable so much to the increased quantities of ores raised from our home mines, therefore there is not a corresponding increase of industry and employment. It is true that wages in the West range high, and that good miners are in request, but this arises chiefly from emigration to America, Canada, California, and Australia. Workmen will do well to remember that though large profits necessarily involve high wages, yet the employer is not to be sacrificed by the employee, for both constitute one community bound together by common commercial interest, and incapable of rising or falling except to the gain or loss of the whole body.

R. TREDDICK,

3, Crown-court, Threadneedle-street, Aug. 20.

Consulting Mining Engineer.

#### MINING IN MONA'S ISLE.

Sir,—Permit me to make a few observations upon the article headed "Mining in Mona's Isle," inserted in the Journal of last week. The mines never returned a profit of seven millions. The profits immediately upon the discovery of the great deposit were no doubt large, though not equal to one-fourth of the sum named, but these continued for a short time only. And, upon the exhaustion of the great mass by open workings, the mines were continued by shafts and levels with varied success, and with a moderate return upon the enormous capital employed. These are facts beyond dispute. It is also untrue to state that two English peers owe their elevation in the main to social preferment purchased by the profits of the



## Royal School of Mines, Wernmyn Street.

[FROM NOTES BY OUR OWN REPORTER.]

**LECTURE XLVII.**—There have been great improvements (said Mr. SMYTH) of late years in the modes of raising the mineral from the workings underground, and the quantities now drawn from a single colliery per diem are enormous, often reaching from 1000 to 1600 tons in the best managed mines. There have also been great improvements as to the safety and welfare of the men in lowering them to their work and bringing them back to surface. Amongst the worst of the methods now in vogue are those yet prevailing in South America, where men carry on their backs loads of material or masses weighing as much as 200 lbs., up small ladders, and under difficulties which make one wonder at their patience and endurance. Neither have the old ways of raising and lowering the men by the windlass quite died out; and men yet put each a foot into loops attached to the end of the rope, and go down through the shaft like a bunch of grapes—of course at a slow speed. This was common in some parts of Somersetshire half-a-dozen years ago. In some cases the men would sit astride of a stick lowered by a rope; and several of these devices may be seen now in the Isle of Man. In Spain the Government made it unlawful for anyone to descend the mines unless he had a rope or strap embracing his body, so that if his foot slipped he could not fall. In metalliferous mines the drawing must be done alternately from the different levels; and the system of dropping the men at one certain place, as in collieries, is not convenient. Besides this, the shafts frequently are only perpendicular in part, and require guiding apparatus of a most complicated character, as well as connecting rollers. In places where there are tipping-plates also special arrangements are requisite, so that if men were allowed to ride up and down the shafts serious accidents would be sure to occur. It is true that men are occasionally, in spite of all risks and against all rule, ride up and down; but if the ladders were properly inclined and have plenty of room, there is not the slightest reason why these risks should be run, "unbeknown," as they say, to the authorities. I have already described to you the "faikunst," or man-engine, as it is called here, and its advantages; but I did not mention that by means of what are termed "keeps" the cage is brought to rest at the proper place; this is done generally with such accuracy that at a depth of 150 fms. the cage will stop to 1/2 inch.

In dealing with cages of several compartments a good deal of arrangement is required. For instance, at the Grand Hornu and at Monkwearmouth they use cages with four bunks. It is obvious that to load them from one level the cage must be shifted four times, which would cause so much loss of time as to neutralise the advantage of having the cage so large. To meet this difficulty, the trip-plates are so arranged that each deck corresponds with a flooring of the level, and so all the four wagons of coal are run into the cage at the same time; and at the surface a similar arrangement is made, and the arrival of every cage creates a scene of great bustle and activity. These, and all the others at which we have glanced, answer very well at the depths attained at the present time; but what is to be done when greater depths are reached is a problem now to be solved. We have at Rosedale a colliery working at a depth of 800 yards, and there are one or two in Belgium working at depths of from 600 to 800 metres, and every year will infallibly add to the fathoms from the surface; and the question of greater economy in drawing combined with safety, daily becomes more important.

Amongst the plans for increasing facility put forward is one invented by Mr. Maydieu, a working model of which was exhibited at the Paris Exhibition. It was something like the "faikunst," consisting of two rods in the shaft, fitted at the proper intervals with platforms, which almost touched corresponding stationary platforms at the side, forming within a very small distance; and the wagon is so placed that it runs from the one to the other, and is secured by self-acting taps, so that when the loaded carriage meets the station opposite it moves the catch, and enables the wagon to run across to the other side, when a similar catch falls, and keeps it in its place till the next resting platform is reached. This apparatus has been erected on a working scale at Anzin, and is spoken well of; but I am afraid that it is hardly simple enough to become generally useful. The fact is that self-acting machinery is always liable to coal pits, from the superabundance of dust on the one hand, or moisture on the other, to get out of order, and lead to accidents. Mr. Lonielle, inventor of a very effective ventilating fan, has also directed his attention to this subject, and has planned a plan, which, if carried out, will be a great improvement. Lonielle and Aytoun's plan was to turn the drawing rope into an endless rope, and it is in use at some pits of moderate depth, near Wigan. Working coal at depths such as I have mentioned has shown that wire-rope, whether flat or round, are capable of dealing with greater depths. It has been found, too, that in many cases it is an advantage where the rope tapers from the top to the bottom, because the thicker and upper part has the weight of all the lower part to sustain, as well as the burden of its extremity.

We will now pass on to the subject of water in mines, and the means by which it is to be extracted. This opens a large field of an interesting character. The first point to consider is from whence the water originates which flows into our mines. This is a point of great importance, and yet mine managers are apt to give it but little attention. The result is that in many cases the same water has to be lifted over and over again, at I need hardly say, a great expense, which might be saved. A very valuable communication has been made to the Dudley Society, by Mr. Martin, a civil and mining engineer of that district, who shows that in a well-known coal mining district of South Staffordshire, extending over 125 square miles, about 50,000,000 gallons have to be pumped up every day of 24 hours; this would weigh 220,000 tons, or ten times the quantity of coal and other mineral raised in the district. In order to accomplish this a force of 5000 horse power is employed in engines of various sorts. If we come to consider the capital invested in these engines and the requisite machinery, and the great expense of fuel and labour, we shall see that this is a serious drawback on the profits of getting minerals. In other districts the proportion of water raised is even greater. But the point we have to consider is, where does all this water come from? Is it the result of rain-fall or of subterranean stores? Or does any portion of it, which is pumped out find its way back again, by natural gravitation and percolation? Experiments have shown that no rain-fall has ever taken place within a given period which would account for a vast supply of water, and (feathers notwithstanding) it is impossible to come to any other conclusion than that, whether poured into streams, canals, or surface reservoirs, as the case may be, a considerable proportion must find its way back, if not into the same mine, into others adjacent. If we knew a little more of the sources of underground waters, and could get facts for comparison, this would become more apparent. For instance, taking Cornwall, Devon, and South Wales, and comparing them with any similar mining district on the continent, we find the former more highly watered, and to a great extent in an undrained degree, requiring far more engine-power than is needed on the continent. If we pass to those mines which are under the sea, they are the very driest, and form a complete contrast in that respect to those on the main land. Of course, something is due to percolation, the conditions of which are often of a complex order, and of which we know little. There is a remarkable chapter on this subject in the work recently published by the Professor of Chemistry at Bonn, to which I refer you. I have been listening to this very afternoon to some most interesting statements, placed by Mr. Prestwich before the Geological Society, on the passage of rain-water beneath the basins of London and Paris, and the mode in which the first percolates through the various overlying rocks; and this is a question which ought to be at the finger's end of all mining engineers, and especially if they have to deal with districts that are heavily watered.

To deal practically with the subject we must first see how the water occurs in the mine. As the shaft is sunk it passes through a variety of strata, some containing more or less water, and some probably entirely free; an alternation of this kind makes the task comparatively easy. Tabling must be put in so as to secure all the watery beds, and prevent any water from passing down the shaft, and then the mineral can be worked dry. The nature of the beds being thus understood, a system of working should be adopted which would avoid breaking away the roof, and the pumps must be kept going continually, the influx of water arising from portions of the workings. A remarkable instance of this kind occurred in 1868 at the salt mines of Wieliczka, where the shaft itself being free from water, the rock salt and the ground about it also free from water, they drove out to intersect the mineral at another point, and in doing so had to pass into a new series of deposits. This was done without sufficient precautions, and the result was that a feeder of such tremendous power was tapped, which bore a body of water, that the safety of the mine was endangered. The dams put in were insufficient to withstand it, and the new level was broken down into a mass of ruin. The water then made its entry into the mine, and nothing else but its total destruction was expected, and the cavities worked out being enormously large, the destruction also of the town, the houses, the castle, the gardens, and the fields above it at the surface, so that the greatest terror took possession of the people. The pumping power was quite insufficient to cope with the mischief, and no provision had been made, although they were driving into new ground, for such an emergency. Great exertions were made, new and powerful engines were erected, and pumps put down, and although the feeder was mastered before the mischief done was irreparable. This was an extraordinary case, but we all know that great quantities of water, without such sudden outbursts, find their way into the mines. In investigating where it comes from, the temperature of the water is a matter of importance. It will show whether it comes from a district cooler and therefore shallower than the point of issue, or the contrary. It is important also to have an eye on the surface drainage, as the rainfall may be conducted to a place whence it may get into the mine, and in some cases the influx from this source is considerable. At other places its progress and source may be tested by the sub-sides which it is impregnated with, the locality of those substances being known. In metalliferous mines the quantity does not as a rule increase as they descend in depth, and there is an advantage in dealing with the water at moderate depths separately from that which comes in at greater depths, because of the greater distance there is to lift the latter. Water will never be found in any mine to occur homogeneously—that is, there will be more or less in different places; but the great point to ascertain is whether it comes in within the walls of the lode, or from elsewhere. Water comes in generally from the ends or downwards, but there are cases in which it is seen to be distinctly rising upwards.

In metalliferous mining, too, it is generally found that one level drains the ground immediately over it, and it is better to pump it out from that level than to let it descend to the bottom of the shaft, and, therefore, the best efforts of the mining engineer should be to prevent the water going downwards. There are some remarkable cases of the occurrence of feeders of water at different depths. In the limestone districts of the North, where vertical and open fissures extend largely through the formation, the water accumulates so much at certain depths as sometimes to put a stop to mining. Thus, in Derbyshire enormous pumps are put in, and are only able to raise the water from 10, 15, or 20 fathoms, while in other districts the same engines would clear an extensive area. The limestone is worse than any other deposit in this respect. In Flintshire the pumping engines are from any other fall of rain; and in all districts wet weather is sure to make itself felt sooner or later. At the present moment, in Cornwall, the miners are struggling against an unusual influx of water, and where they are not provided with a sufficient amount of power they are greatly put about, and some of their workings are under water. This, if it happened to any extent, would be a serious matter, and, therefore, agents should take notice of these things, that they may be ready to pro-

vide for difficulties as they occur. Sometimes water will be found in such abundance that hardly any power brought on it is capable of raising it; whereas, at Castleton and at other places in Derbyshire, they work to a certain depth without water, and have no necessity for employing engine power. These are cases of "poor men's mines," and the miners live from hand to mouth on the ore they raise.

There are a great number of districts like this in the world, where no water is met with, and most notably as regards ores of silver. At Chanarillo, in Chili, and in a famous district in the South-East of Spain, near the town of Berja, a district which produced such quantities of lead ore as to interfere with the commerce of the world, although the workings are 300 yards below the surface, they have no water to dress the ores with, and it had to be brought to the mines from distances of many miles. In the limestone districts, however, there is generally a point where a water level may be put in with advantage, as, for instance, in the Peak in Derbyshire. On the Continent works of this kind are undertaken by Government, which reimburses itself by a charge on the produce obtained. In this country it would be impossible to obtain parliamentary aid to drive an adit level, and a private co-operation would be sure to be hindered, if not defeated, by the selfishness of some who will not agree to the necessary conditions. This is unfortunate, for there are some coal in the North of England only to be obtained by some such operations, which, if they were undertaken by any one person, or any one company. The same may be said of North and South Staffordshire, where a good deal has at times been talked of some concerted action for the purpose of erecting pumping machinery sufficient to free an entire district from water. At present, however, no large scheme of this kind is in operation, and in South Staffordshire, where it has been attempted over small areas, the engines are of too economical a sort. They ought to be replaced by engines of a different construction, and differently managed; but that can only be done by the united action of the persons interested in the question.

## JOURNAL OF THE DAILY MEETINGS OF THE BRITISH ASSOCIATION AT BRIGHTON.

**FRIDAY (continued).**—The attention of the day centred in the Geographical Section, where Mr. H. M. Stanley's communication, the result of his discovering Dr. Livingstone, attracted a large, attentive, and animated audience, for the reception of which additional accommodations had been very providently provided. A lively discussion followed the reading of the paper, to which Mr. Stanley made a suitable and energetic reply, concluding that few who heard him would probably be fully satisfied in respect to the great African explorer until he should himself appear before them, probably some two years hence. There are not a few who seem to overlook that Mr. Stanley has faithfully and most completely fulfilled his mission, which was not to make African discoveries, or settle geographical disputes, but to discover the whereabouts of a notable missionary, hitherto given up as either murdered, or as long since falling a victim to climate, fatigue, and want of natural supplies of good clothing and medicines—this it is which he has nobly and ably effected, and it is for this, his wonderful pluck, energy, and success, that he deserves our unbounded applause.

At half past eight o'clock in the evening the Dome was crowded with a learned and a fashionable audience to hear Prof. Duncan's discourse on Insect Metamorphosis, a rather dry and difficult subject to make popular; and perhaps it would, on the whole, be more to the purpose to enlighten the public mind on matters of larger public interest. Undoubtedly, however, the most was made of this minute and difficult matter of investigation in as clear and concise a way as it could possibly be rendered.

**SATURDAY.**—The reception room, both yesterday afternoon and this morning, has presented a scene of great activity among members seeking tickets for one or other of the excursions provided, of which the printed list gives details. Wherever there is limitation there is necessarily also much disappointment, and much suspicion of the exercise of favoritism, the limits being to parties of 50, 60, and up to 150, for each place of interest.

Among places to be visited on the spot requiring a special ticket is the aquarium, at the rate of 400 per day, equal in all to 2400 persons; non-ticket holders having to pay 2s. 6d. for admission. Up to Thursday the water was from some means or other very murky, and the supply of fish very small indeed. On and since Friday the number of specimens has been enlarged, while the water has also become clearer, so that there is not the slightest difficulty in observing the manners of the inhabitants of each tank. In one part ever tanks have communication, so that turtle may be seen gradually swimming from one to the other, as well as varieties of fish of several species. For the moment one feels as if descending to some bottom of the sea, and on each side the glass fronts of the tanks arranged down each side, and lighted from above through the water. Beneath is a beautiful tessellated pavement, and at the far end we hear and see a picturesque waterfall amidst red sandstone and ferns. As this is altogether apart from the meeting, it does not further concern us at present, but we say to all—go and see for yourselves, as you will be sure not to be disappointed.

The business of the sections has been purposely limited as much as possible to papers of some urgency, applying to the following five departments:

**SECTION A—MATHEMATICAL AND PHYSICAL SCIENCE.**—J. W. L. Glaisher: Report on Mathematical Tables.—W. H. L. Russell: Report on Hyper-Elliptic Functions.—Prof. Hermite: On the Elimination of Arbitrary Functions.—J. W. L. Glaisher: On the Law of Distribution of Prime Numbers.—J. W. L. Glaisher: On a Function Standing to Bernoulli's Numbers in the Relation that the Gamma Function bears to Factorials.—J. W. L. Glaisher: On the Evaluation of a certain Integral in series.—J. E. Hilgard: On a Verification of the Probability Function.—Prof. H. J. Stephen Smith: On the Circular Transformation of Mobius.—Prof. Clifford: On the Contact of Surfaces of the Second Order with other Surfaces.—Prof. Everett: On Focal Lines.—Prof. James Thomson: On Atmospheric Refraction of Inclined Rays.—Prof. Everett: On Mirage.—Dr. J. Hopkinson: On the Stress produced by Inequality of Temperature.—Prof. Tait: On Double Neutral Points in Thermo Electric Circuits.—Prof. Tait: On Sympathy of Pendulums.—T. W. Lee: On the Human Voice as a Musical Instrument.

**SECTION C—GEOLOGY.**—William Jolly: Report on the Discovery of Fossils in certain remote parts of the N. W. Highlands.—Prof. E. Hebert: Sur les divisions de la Craie en France, leurs limites, leurs faunes, leur histoire des divisions des cotes du detroit.—Prof. H. Alleyne Nicholson, M.D., F.R.S.E.: On the Geology of Thunder Bay and Shabdenowan Mining Districts on the North Shore of Lake Superior.—Prof. H. A. Nicholson: On Ortonia, a new genus of Fossil Tubular Annelides, with Notes on the genus Tentaculites.—Rev. Canon Tristram, F.R.S.: On the Geology of Moab.—Prof. Edward Hull, F.R.S.: On the Trachyte Porphyry of Antrim and Down, Ireland.

**SECTION D—DEPARTMENT OF ANTHROPOLOGY.**—W. Boyd, Dawkins, M.A., F.R.S., and B. H. Tiddeman, M.A.: Report on the Victoria Cave, Explored by the Settlement of Sir Duncan Gibson, Bart.: On Stone Implements and Fragments of Pottery, from Canada.—Sir Duncan Gibson, Bart.: On a Patoo-patoo, from New Zealand.—Sir Walter Elliot, K.C.S.I., F.R.S.: Results of Ten Years' Diggings in Barrows on the Wolds of Yorkshire. (Second Paper.)

**SECTION E—GEOGRAPHY.**—Rev. Edward Ha'e, M.A.: The Place of Geography, Political and Physical, in Education.—H. H. Howarth: Recent Changes of Level in Land and Sea.—W. F. Meyers: The Pathways of Yunnan.

**SECTION G—MECHANICAL SCIENCE.**—Report of Committee for Measuring the Speed of Ships: Report of Committee on Steam Boiler Legislation: Report of Committee on Rainfall.—W. Fronds, F.R.S.: Mode of Recording the Rolling of a Ship in a Sea-way.—C. W. Merrifield, F.R.S.: On the Measurement of Waves.—W. F. Eckart: On Marine Propulsion (Steam Launches).—Hyde Clarke: Progress of Through Railway to India.—R. Eaton: On Warsaw's Aero-System as applied to Locomotives.

Four days' experience enables us to say that the general impression is in favour of the present being a most satisfactory and successful meeting. Fine genial summer weather, a great contrast to recent thunderstorms and rain, has, no doubt, contributed largely to the visitation of many of the metropolis and neighbouring towns, who might otherwise have been deterred from seeking their enjoyment in Brighton. On the part of all concerned in promoting the arrangements necessary for receiving such a concourse of people no thought, or labour, or expense seem to have been spared, for everything has been done well and liberally.

In the evening an agreeable episode was enacted at the Dome, where was collected a large gathering of working men, to hear a lecture by Mr. W. Spottiswoode, F.R.S., the general treasurer of the association, on certain properties of light, announced under the title of "Sunshine, Sea, and Sky." By 8 o'clock the vast amphitheatre, under the dome, was filled to overflowing. The lecturer, in his discourse, before a sea of upturned and anxious-looking faces. The hall was in a state of semi-darkness, while behind the lecturer was a large screen, as prepared for magic lantern illustrations; on this appeared a large disc of light, rather reminding the spectators of the moon than its rival, the sun. However, there lay the point of attraction to all gazers, especially as it became the field for a variety of coloured rays, and varied spectrum appearances. The lecturer was supported, after the delivery of his lecture, by Sir John Lubbock, Prof. Tyndall, and other speakers, whose efforts were directed towards apprising the audience of the high character of the optical apparatus employed in the very beautiful and interesting experiments they had just beheld; and, neither last nor least, to explain the possible cause of the spectrum of the moon than its rival, the sun. However, there lay the point of attraction to all gazers, especially as it became the field for a variety of coloured rays, and varied spectrum appearances. The lecturer was supported, after the delivery of his lecture, by Sir John Lubbock, Prof. Tyndall, and other speakers, whose efforts were directed towards apprising the audience of the high character of the optical apparatus employed in the very beautiful and interesting experiments they had just beheld; and, neither last nor least, to explain the possible cause of the spectrum of the moon than its rival, the sun. 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Prof. Edward Hull, F.R.S.: On the Trachyte Porphyry of Antrim and Down, Ireland.—Rev. John Gunn: On the Prospect of Finding Productive Coal Measure in Norfolk and Suffolk with Suggestions as to the Places best adapted for an Experimental Boring.—Prof. James Hall: Note on the Occurrence of Eretz Bases or Trunks of Pteronites in the Devonian Rocks of New York, U.S.A.—W. Carruthers, F.R.S.: On the Tree Ferns of the Coal Measures, and their Affinities with Existing Forms.—Prof. Albert Gaudry: Sur les Animaux Fossiles du Mont Leberon.—Prof. James Hall: On the Geographical Distribution of the Middle and Upper Silurian (Clinton, Niagara, and Upper Helderberg) Formations in the United States.—Thos. Davidson, F.R.S.: Brief Notice of the Present State of our Knowledge in Connection with the Brachiopoda.—Thomas Davidson, F.R.S., and Prof. William King, D.Sc.: Remarks on the Genera Trimerella, Dinobolus and Monomerella.—G. von Rath: On a Remarkable Block of Lava, ejected by Vesuvius during the Great Eruption of April, 1872, proving the Formation of Silicates by Sublimation.

SECTION D—BIOLOGY.—DEPARTMENT OF ZOOLOGY AND BOTANY.—R. Cail: On a Salmon Pass.—Rev. J. T. Gulich: On Diversity of Evolution under one set of External Conditions.—W. B. Hemley: Summary Analysis of the Flora of Sussex.—Prof. Allman: On the Structure of Edwardsia, Cyphonantes, and Noctiluca.—Prof. Allman: On the Development of Vorticellidae.—Professor Dickson: To Exhibit a Series of Cones of Pinus pinaster, illustrating Transition by "Convergence of Secondary Spirals"—D. A. Spalding: On Insects.—F. T. Mott: On the Scientific Value of Beauty.—R. A. Peacock: On Natural History Museums.

DEPARTMENT OF ANTHROPOLOGY.—Prof. Robertson, M.D., F.R.S.: On some Skulls from the Yorkshire Barrows.—A. Campbell, M.D.: Notes on the Looshals.—Major H. Godwin-Austen, F.R.G.S., F.Z.S.: On Garo Hill Tribes, Bengal.—B. Shaw, F.R.G.S.: On Religious Cairns of the Himalayan Region.—Hyde Clarke, D.C.L.: On the Manyama or Manyema of Dr. Livingstone.—Dr. Charnock, F.S.A.: On the Roumanian Gypsies.—Dr. Nicholas, M.A., F.G.S.: On the Ethnological Relations of France and England.—Dr. Charnock, F.S.A.: On the Prussians.

DEPARTMENT OF ANATOMY AND PHYSIOLOGY.—Prof. Chauveau: Note on Recent Researches on the Infection Process.—Prof. Sanderson, F.R.S.: On the Rhythmic Variation of Arterial Pressure.—H. Garner, B.A.: On Pulse Frequency, and the Forces which Vary It.—Dr. Radcliffe: On the Nature of Muscular Contractility. (Discussion continued).—E. A. Schaffer, M.B.: Experiments Relating to the Coagulation of the Blood.—M. Georges Pouchet: On the Mechanism of the Changes of Colour in Fishes and Crustacea.—G. A. Lebour, F.G.S.: On the Geological Distribution of Goitre.

SECTION E—GEOGRAPHY.—General Strachey, R.E., F.R.S.: On the Scope of Scientific Geography, illustrated by Remarks on the Climate of British India.—Dr. Brandis: Geographical Distribution of Forests in India.—Dr. J. C. Brown: Destruction of South Africa.—Mons. G. Lemoine: Sur les forêts dans leurs rapports avec l'Hydrologie.—Sir G. Young, Bart.: Is the Asiatic Emigration to the West Indies likely to be a Permanent Fact in Modern Geography?—John Bale, F.R.S.: Orography of the Chain of the Great Atlas.

SECTION F—ECONOMIC SCIENCE AND STATISTICS.—Dr. Edward Smith, F.R.S.: The Economic and Nutritive Value of the Three principal Preserved Foods—Preserved Milk, Preserved Meat, and Liebig's Extract of Meat.—Major-General Sir James E. Alexander, F.R.S.E.: On the Pollution of Rivers.—Lydia E. Becker: On the Attendance and Education of Girls in the Elementary Schools of Manchester.—Hyde Clarke: Polygamy as Affecting Population.

SECTION G—MECHANICAL SCIENCE.—W. Hope, V.C.: Estimation of the Error in the Flight of Heavy Projectiles, due to the Woolwich System of Rifling.—Report of the Committee on the Treatment of Sewage.—Major-General H. Y. D. Scott, C.B.: Defeating Sewage and Utilising the Deposit for the Preparation of Lime and Cement.—Major-General H. Y. D. Scott, C.B.: On the Agricultural Value of the Lime Compounds resulting from the before-named Process.—William Paul: On the Mechanical Effects of Unclarified Sewage of the Soil and Vegetation.—J. P. Colborn: On the Drainage of Shropshire.—John A. Gamble: On the Drainage of Brighton.

T. Curley, F.G.S.: The Sewage Difficulty.—D. T. Bostel: Modification of the Earth Closet.—David Carter: Modification of the Earth Closet.—T. Webster, Q.C., F.R.S.: On the Advancement of Science due to the Result of Patented Inventions.

The talk of the day is principally about the excursions, which have been favoured with uncommonly fine, genial weather, and appear to have been in all respects satisfactory. But we have to deplore that a black spot has suddenly, and most unexpectedly and unfortunately, appeared to sully the brightness of all our best hopes and wishes, although, fortunately, it has no direct connection with the British Association, or any of its individual members. The Brighton and Sussex Medical-Chirurgical Society gave a dinner on Saturday at the Royal Pavilion, which Mr. H. M. Stanley was one of the invited guests. It is said that while he was delivering a humorous speech, in which he had just spoken of Dr. Livingstone for his eminence as a medical man, with his usefulness among his present strange and incongruous patients, "some person among the company gave utterance to what Mr. Stanley apparently regarded as a derisive laugh" (the papers state), on which he changed his tone, and summarily left the room; and next morning returned to London. We have already said, and this fact confirms our remarks, that many persons wholly overlook or forget the purpose of Mr. Stanley's mission; but, perhaps, what operates worse than even this injustice is the supposition that arose over so remotely mixed up in the misunderstanding which unfortunately exists between Dr. Kirk and the great African explorer. Englishmen of all classes can have but one opinion as regards Mr. Stanley, and that opinion is, that he deserves unbounded praise for his great ardour and wonderful success—a success which cannot fail to promote the future welfare and progress of Dr. Livingstone in his marvellous exploit, important alike to Christianity, and scientific and mercantile progress.

The general committee met in the Town Hall at three o'clock, and was addressed by deputations from Belfast, Bristol, Glasgow, and Bath, each urging claims to induce precedence in the acceptance of their invitations. One argument that arose was to the effect that the association's best meetings had not always taken place in the largest towns. The next meeting is appointed to take place in Bradford, 1873, under the presidency of Dr. Joule, of Manchester; and in 1874, at Belfast. The election of officers, and other matters of form, concluded the business of the committee.

At half-past eight o'clock in the evening the Dome presented a lively appearance, being filled, without exception, by a fashionable audience, to hear the discourse of Prof. Clifford on "Scientific Thought." This difficult mathematical and metaphysical subject the learned lecturer dealt with in an exceedingly popular and pleasing style; and what was almost equally appreciated was that every member present could clearly hear all his observations, of which the best evidence was afforded by the constant and hearty applause, that at times almost interrupted their delivery. His many happy familiar illustrations following abstract statements in relation to gravitation, the divisibility of matter, cause and effect, trigonometry, crystallography, hydrostatics, and other problems, caused hearty and continued marks of approbation, so that Mr. Clifford's lecture will assuredly be spoken of as one of the successes of the present gathering.

TUESDAY.—The papers brought before the various sections follow in order annexed:—

SECTION A—MATHEMATICAL AND PHYSICAL SCIENCE.—Charles Meldrum: On a Periodicity in the Frequency of Cyclones.—Prof. Croulebois: On the Action of Quartz on Ultra-Violet Rays.—Prof. Croulebois: On Tubes Phosphorescent by Friction.—Dr. J. Hopkinson: On the Stresses produced by Inequalities of Temperature.—Col. Stuart Wortley: On the Importance of Salts of Uranium in Photography.—G. Vanderhoff Lee: On the Human Voice as a Musical Instrument.—Rev. H. A. Boys: Meteorological Observations in Greece.—T. Ogier Ward: On an Optical Phenomenon.—Dr. Janssen: On a New Form of Thermometer for Measuring the Temperatures of River and Sea Water.—W. F. Barrett: Note on a Condition affecting the Spheroidal State of Liquids, and its Probable Effect on Certain Boiler Explosions.

SECTION B—CHEMICAL SCIENCE.—Dr. T. Wood: On the Teaching of Elementary Chemistry.—Dr. Gladstone: On Filiform Native Silver.—G. Unwin: To Exhibit Specimens of Agate and other forms of Natural Colloid Silica.—Herr von Rath: The Crystallographic System of Leucite.—Dr. Ord: Crystallisation of Salts in Colloid Solutions.—J. A. Wanklyn: On the Common Production of Oxygen.—Dr. Oppenheim: The Action of Phosphorus on Alkaline Solutions of Metals.—J. B. Grantham: Report on the Utilisation of Sewage.—W. J. Cooper: On a Proposed Method of Preventing the Fermentation of Sewage.

SECTION C—GEOLOGY.—Henry Woodward, F.G.S., F.Z.S.—Sixth Report on Fossil Crustacea.—Rev. John Gunn: On the Prospect of Finding Productive Coal Measures in Norfolk and Suffolk, with Suggestions as to the Places best adapted for an Experimental Boring.—Prof. James Hall, F.R.S., and Prof. William King, D.Sc.: Remarks on the Genera Trimerella, Dinobolus, and Monomerella.—G. von Rath: On a Remarkable Block of Lava, ejected by Vesuvius during the Great Eruption of April, 1872, proving the Formation of Silicates by Sublimation.—J. Gwyn Jeffrey, F.R.S.: A Few Remarks on Submarine Explorations, with Reference to M. Delessé's Work, "Lithologie du Fond des Mers."—Dr. Leith Adams, F.R.S.: Report on the Fossil Elephants of Malta.—W. Boyd Dawkins, M.A., F.R.S.: On the Physical Geography of the Mediterranean during the Pleistocene Age.—Charles Moore, F.G.S.: On the Presence of Naked Echinodermata (Holothuria) in Oolitic and Liasic Beds.—John Edward Lee, F.G.S.: Notice of Venus or Fissures in the Keuper filled Rhetic Bone-bed at Goldcliff, in Monmouthshire.—Robert Sim, M.D.: On Certain Quartz Nodules occurring in the Crystalline Schists near Killin, Perthshire.—W. Molyneux, F.G.S.: On the Occurrence of Copper and Lead Ores in the Hunter Conglomerates of Cannock Chase.—T. Ogier Ward, M.D.: On the Formation and Stratification of Sedimentary Rocks.—T. Ogier Ward, M.D.: On Silicified, or Rubbed, Polished, or Striated Rocks.—T. Ogier Ward, M.D.: On the Scientific Value of Beauty.

SECTION D—BIOLOGY.—DEPARTMENT OF ZOOLOGY AND BOTANY.—F. T. Mott: Dr. Schlater: Notice of a Supposed New Marine Animal, occurring in the North Pacific.—H. E. Drescher: To Exhibit British Specimens of Hypobolus heteropus.—Professor Lawson: On a Species of Tortula new to Britain.—Prof. Dickson: Notice of some Fossil Plant Remains from Trap Rocks, near Bowling.—W. Carruthers: On a Radiolarian Rhizopod from the Coal Measures.—Capt. Marshall Hall: Note upon the Elevation in England, West of Scotland.—Prof. Thielson Dyer: On Phylloxera Vastatrix.—C. F. Dennet: On the Applications of Bochemeria Tenebricosa.

DEPARTMENT OF ANTHROPOLOGY.—W. Topley, F.G.S.: On the Relation of the Parish Boundaries in the South-East of England to Great Physical Features, particularly to the Chalk.—J. S. Phené, F.S.A., F.G.S.: On Some Evidence Suggestive of a Common Migration from the East, shown by Archaic Remains in America and Britain.—G. Harris, F.S.A.: Theories Regarding Intellect and Instinct, with Western Anthropologists and Extra-Western Communities.—M. Moggridge, F.S.A.: On the Fossil Human Skeleton of Fontaine.—R. G. Symes, F.G.S.: On Rubbings from St. Patrick's Chair, County Mayo, Ireland.—H. H. Howarth, M.A.: Strictures on Darwinism—the Substitution of Types.

DEPARTMENT OF ANATOMY AND PHYSIOLOGY.—Dr. Richardson, F.R.S.: Report on the Physiological Action of Organic Chemical Compounds.—Dr. Fraser: F.R.S.: Report on Terato-Embryological Enquiries.—Prof. Carl Semper: On Geological Distribution of Goitre.—Dr. F. Crace-Calvert, F.R.S.: On the Relative Protoplasmic and Fungus Life.

SECTION E—GEOGRAPHY.—Capt. Sherard Osborn, C.B., R.N.: Polar Exploration.—A. Buchan, F.R.S.E.: Temperature of Lake Waters.—S. Mossman: On the Topography of Yedo.—R. B. Shaw: On the Pamir Plateau and its Aryan Inhabitants.

SECTION F—ECONOMIC SCIENCE AND STATISTICS.—The proceedings will commence with the reading of Miss Shirreff's paper on the Education of Women, which was read on Friday.—C. J. Dunning: On a Plan for Railway Amalgamation, with Government Control.—C. J. Dunning: The Importance of Providing Additional Facilities for the Instruction of School Board Pupils in the Higher Branches of Knowledge, securing a Scientific Education.

SECTION G—MECHANICAL SCIENCE.—F. Ransome: Improvements in the Manufacture of Artificial Stone.—Major-General H. Y. D. Scott, C.B.: On the Scientific Method of Making Mortar.—A. M. Gordon: Lead-Encased Block-Tin Pipe.—J.

Smyth, M.A.: Apparatus for Testing the Water-Stopping Efficiency of various Substances under Pressure.—E. Easton: The Brighton Waterworks.—A. Upward: Drilling Apparatus for Gas and Water Mains.—F. J. Bramwell: Amster's Plant-Meter.—C. F. Dennet: On Brass-Leading Fire Arms.—Dr. Ord: On the Dome, and its annex the Corn Exchange. The former was principally occupied as the concert room; in the latter was, as before, a fine display of philosophical instruments, novel models, geological specimens, abundance of works of art in metal, glass, china, ivory, silk, &c.; and numerous antiquities, with some of local interest. Besides these the walls of two rooms and a gallery are hung with many masterly paintings, drawings, engravings, &c., so that nothing is wanting to give character and effect to the meetings present reception in Brighton.

The number of members and associates is now ascertained to exceed 2500. WEDNESDAY.—The programme of papers is limited to three sections, and comprises some communications that could not possibly be brought before the sections yesterday, agreeable to arrangements:—

SECTION B—CHEMICAL SCIENCE.—W. J. Cooper: On a Proposed Method of Preventing the Fermentation of Sewage. (Discussion on the report of the Utilisation of Sewage).—Herr von Rath: The Crystallographic System of Leucite.—Dr. Ord: Crystallisation of Salts in Colloid Solutions.—Dr. Oppenheim: The Action of Phosphorus on Alkaline Solutions of Metals.—John Galletly: Ignition of Cotton by Saturation with Fatty Oils.—James Howell: On the Minerals lately Found in the Drainage Works at Brighton, with specimens.

SECTION C—GEOLOGY.—W. Molyneux, F.G.S.: On the Occurrence of Copper and Lead Ores in the Hunter Conglomerates of Cannock Chase.—T. Ogier Ward, M.D.: On the Formation and Stratification of Sedimentary Rocks.—T. Ogier Ward, M.D.: On Silicified, or Rubbed, Polished, or Striated Rocks.—T. Mck. Hughes: On the Announcement of Mr. J. W. Judd of Cretaceous Rocks in the Western Highlands of Scotland.—Prof. Tennant: To Exhibit Specimens of Diamonds from the Cape of Good Hope.—E. R. Readwin: On the Arigna Coal and Iron District of the West of Ireland.

SECTION D—BIOLOGY.—DEPARTMENT OF ANTHROPOLOGY.—Rev. W. Greenwell, M.A., F.S.A.: Results of Ten Years' Diggings in Barrows on the Wolds of Yorkshire, second part.—M. Moggridge, F.G.S.: On the Fossil Human Skeleton of Mentone.—A. A. Carmichael: On a Hypogeum at Valaquie, in North Uist, Scotland.—J. F. Campbell, of Islay: Note on a Visit to the Hypogeum.—Dr. Charnock, F.S.A.: On the Prussians.—Baron Bogushevsky: On Tumuli at Ascheraden, Livonia.—A. L. Lewis, M.A.: The Pretended Identification of the English Nation with the Lost House of Israel.—S. Bannister, D.C.L.: On the Progress of the Britons before the Roman Invasion.

The reading of the papers at the different sectional departments practically completes the objects of the association; what follows is principally for entertainment and amusement, which these sociable scientific gatherings promote in a most agreeable and instructive manner.

The general meeting followed at half-past two o'clock in the Dome, with a full attendance of members and associates, a large proportion of the company being ladies. Dr. Carpenter occupied the chair; and amongst others we observed Sir John Bowering, Sir John Lubbock, Prof. Fawcett, M.P., his Worship the Mayor, Mr. Pengelly, Dr. Dirks, Mr. R. B. Grantham, and numerous others. The various grants of money, exceeding 2000l., having been read, the president expressed his pleasure in being able to state that this large amount was amply justified by the present state of the funds (Applause). A vote of thanks to the Mayor, local secretaries, and others having been proposed, the Mayor very ably addressed the meeting, and the vote passed with acclamation. At the close of the several speeches the President returned thanks, and complimenting those who had assisted him in his duties, announced that they would adjourn to Bradford early in September.

The remaining excursions occupied the attention of members leaving to-day, and of others arranged for those who are leaving Brighton to-morrow.

Dr. CARPENTER, the President, gave a popular lecture on "Chalk," in the Dome, at 8 o'clock in the evening, just after being at a sumptuous entertainment given by the Mayor, at which, as usual, Mr. Stanley was present. The large hall was crowded with a very mixed audience, numbering little short of 2000 persons. The subject matter of the lecture was probably rendered as popular as it was possible from such a high scientific source; still, we very much question if any of the ladies, or one quarter of the male portion of the audience, comprehended a tithe of what was discoursed upon. They were taken from county to county, from one country to another, and informed of so many details about sandstone, lime, and chalk; about stratifications in one place as compared to another; about volcanic disturbances, and about differences found in exploring the Nile, that it was half-an-hour before anyone could know that chalk itself is due to shell formations. If such dry subjects are difficult to popularise, why make the attempt? Or if other topics are more easily rendered in popular language, easier to be made clear through the medium of facts of every day's experience, why not choose such topics in preference? At Norwich Professor Huxley chose this subject "Chalk," for his lecture to working men, and he was both eloquent and charming, for everybody carried something away to repeat, and naturally felt repaid from their having thus readily acquired something to report.

Commencing on Wednesday, the 14th, and concluding this 21st day of August, continued fine, warm, cloudless, sunny weather, his every day greeted the varied meetings of the association, so that from first to last the present session has passed as a decided and long-to-be-remembered success.

The General Committee met in the Town Hall at 1 o'clock to confirm previous recommendations.

A Synopsis of Grants of Money appropriated to Scientific Purposes by the General Committee at the Brighton Meeting in August, 1872, was then read, and the names of the members who would be entitled to call on the general treasurer for the respective grants prefixed, as follows:—

MATHEMATICS AND PHYSICS.		
*Cayley, Prof.—Mathematical Tables	£100	0
*Thomson, Sir W.—Tidal Observations	400	0
*Brooke, Mr.—British Rain-fall	100	0
*Everett, Prof.—Underground Temperature (£100 renewed)	150	0
*Griffith, Mr. G.—Auriferous Minerals (renewed)	25	0
*Glaisher, Mr. J.—Luminous Meteors	30	0
*Glaisher, Mr. J.—Efficacy of Lightning Conductors	50	0
*Williamson, Prof. A. W.—Festing Siemens' New Pyrometer (renewed)	30	0
*Huggins, Dr. W.—Table of Inverse Wave Lengths	150	0
*Tait, Prof.—Thermal Conductivity of Metals	50	0

CHEMISTRY.		
*Williamson, Prof. A. W.—Records of the Progress of Chemistry (£100 renewed)	200	0
*Gladstone, Prof.—Chemical Constitution and Optical Properties of Essential Oils	30	0
Brown, Prof. Crum—Temperature of Incandescent Bodies	50	0
Brown, Prof. Crum—Electric Tensions of Batteries	25	0

GEOLOGY.		
*Ramsay, Prof.—Mapping Positions of Erratic Blocks and Boulders (renewed)	10	0
*Lyell, Sir C., Bart.—Kent's Cavern Exploration	150	0
*Lubbock, Sir J.—Exploration of Settle Cave	50	0
*Griffith, Mr. G.—Auriferous Minerals (renewed)	25	0
*Harkness, Prof.—Investigation of Fossil Corals	25	0
*Carruthers, Mr.—Fossil Flora of Ireland	20	0
*Harkness, Prof.—Collection of Fossils in the North-West of Scotland	10	0
*Byce, Dr.—Earthquakes in Scotland	20	0
*Willett, Mr. H.—The Sub-Walden Exploration	25	0

BIOLOGY.		
*Lane Fox, Col. A.—Forms of Instruction for Travellers	25	0
*Glaisher, Mr. G.—Record of the Progress of Zoology	100	0
*Christison, Sir R.—Autism of the Action of Poisons	20	0
*Balfour, Prof.—Effect of the Denudation of Timber on the Rain-fall in North Britain (renewed)	20	0

MECHANICS.		
*Grantham, Mr. R. B.—Treatment and Utilisation of Sewage	100	0
*Froude, Mr. W.—Experiments on Instruments for Measuring the Speed of Ships and Current (£30 renewed)	50	0

Total £2025 0 0  
The PRESIDENT then declared the meeting adjourned until 1873.

#### PATENTS OR NO PATENTS.

Remarks on the paper of Mr. Thomas Webster, Q.C., "On the Advancement of Science, Due to the Result of Patented Inventions." By HENRY DUKES, C.E., LL.D. British Association, Brighton, Aug. 19.

It may seem strange even to many now present to learn that it is requisite to advocate the patenting of inventions as one means, however uncertain in its results, of encouraging and rewarding inventors for the exercise of their skill and ingenuity, and for their incurring the first risks, whether heavy or small, of experimenting and bringing their processes or machines to some state or other of practical bearing. But if such is the case before the members of the present mechanical section, what must the outside public think when informed that because free trade is good as applied to corn, provisions, and mercantile commodities generally, so in like manner it is assumed by a large and influential portion of manufacturers throughout the United Kingdom; and many boards of trade, composed of these and other classes of the commercial community, have arrived at the conclusion that it would be an equally good thing to enjoy free trade in every ingenious and valuable mechanical invention. A monstrous proposal is glossed over, and attempted to be rendered of commercial value to the inventor by means of some kind of indefinite monetary measure, amounting to a very doubtful kind of bill of exchange—a promissory note to be paid in some not impossible manner, and which, nevertheless, our highest and have drawn into their own way of thinking (on this matter), unhesitatingly protest that they believe some such source of indemnity would be more valuable to those manufacturers to whose operations their inventions or improvements mainly apply, is neither more nor less than a deeply designed plan to cripple invention, to cripple improvement, to maintain old modes of manufacture and high prices, so long as can possibly be done; and as a consequent inevitable result thereby materially to cripple the advancement of science; for the dependence of the progress of science is mainly due to the stimulus to applications brought about by inventors—greater, indeed, than the public are aware of, or than manufacturers care to consider. Trade and science are thus the antipodes of each other in the matter of patents.

Then, as regards the public, the masses of the people; they are only indirectly benefited by those patents to which at their outset manufacturers have persistently opposed. There is not any invention that has proved of great public interest and value that manufacturers have not endeavoured to prostrate and keep out of the market on its first appearance.

And we are now told, as a last resort, that invention is an effort of the mind, and that, therefore, as one man may invent as well as another—ergo, no man has a right to claim a pecuniary interest in what he may be indebted to his individual thought, leading to an invention in mechanism or chemistry, or to any improvement in such invention made by other individuals. Such reasoning may be taken for what it is worth, and that is very little indeed.

I can only say in conclusion that, with all its faults, the present Patent Law is

better than no Patent Law at all; and we may rest fully satisfied that the first decline of science will date from the abolition of such protection.

#### ROYAL CORNWALL POLYTECHNIC SOCIETY.

The Royal Cornwall Polytechnic Society, which has rendered so much service to Cornwall in general, and in Cornish mining in particular, though liable like all other human institutions to fluctuations, shows no signs of decrepitude. It is now holding its 40th annual exhibition, and it is worthy of remark that whilst the more popular fine art department is of full average excellence, and the section devoted to natural history exceedingly good, the mechanical department, with which we are more immediately concerned, has not looked better, nor, indeed, in most respects so well, for years. It is in stimulating and rewarding invention, and in fostering mechanical skill—not in one direction alone but in many—that the Polytechnic has carried on its chief work. No one can deny that its work has been done well; and that, as a result of the operations of the institution, Falmouth has become the focus of the practical science of the county. For the last 40 years there has hardly been a single invention of importance to the interests of mining, at this moment we do not recollect one—that has not had the stamp of the Polytechnic's approval. Hence has arisen a double advantage—practical men have known where to look for invention and inventors where to seek the necessary recognition.

The attention of our miners is now directed chiefly towards the improvement of dressing operations. In the present exhibition are contained several forms of mechanism designed to meet their wants. In the first place there are three new kinds of stamps. Two of these, those of PROSSER and ENNOR, are gravitation; the third, that of the Messrs. WILLOUGHBY, operates upon the principle of the spring steam-hammer. Prosser's stamps are shown ready for use, as manufactured by Mr. N. Sara, of the Penrhyn Foundry. They are intended for a mine in America, and are made in parts for the convenience of transit on mules. Their peculiarity consists in the stamp-heads being continuously rotated by gearing at the upper part of the rods. Power is economised by the lifting-cams being made to act immediately upon the levers instead of upon the rods themselves. To this apparatus several judges have awarded a second silver medal. Mr. N. Ennor shows several working models of his improvements in stamps, which consist in the application of efficient levers in the lifting of the heads. In some of the models the heads are lifted on the hammer principle. In others a lever of the second order is used. In others, again, both plans are combined. As the levers have to be moved through a greater distance than the old lifters in order to be effective, the old axle has to be dispensed with, and gives place to a wheel or drum of the required diameter, with catches which lift on one side and tilt on the other. There is no question that Mr. Ennor has contrived a very ingenious and cheap mode of saving power, and that stamps made upon his principle would be exceedingly economical in use. That the judges were of this opinion is shown by their awarding a second silver medal in this case also. Messrs. Willoughby's model spring-stamps did not arrive until late in the afternoon of the 14th inst. They are worked by a crank, and their peculiarity consists in the stamp-rod not being continuous, but being in two sections connected by a very strong spring. This contrivance not only renders the blow far more effective than it otherwise could be, but enables the stamp-head to adapt itself to the height of the ore in the coffer. But for the difficulty of overcoming the latter point the knell of gravitation stamps would have been sounded long since. Messrs. Willoughby receive a first silver medal.

A new form of pulveriser is exhibited by Mr. W. SARA, in which the ore will be reduced by grinding between channelled metal plates revolving in opposite directions, and fed from the centre. This apparatus is to be tested in practice at Pedn-an-drea, and the judges have postponed their award until proof has been given of its capabilities. To Carr's disintegrating flour-mill a first silver medal is given. The principle upon which this machine operates is peculiar, and may be applied, as a model shows, to the reduction of certain classes of ores—though it is hardly likely to be of much service in Cornwall. There is no grinding whizzer. Two plates, studded with concentric rings or cages of pegs, called beaters, are made to revolve close to each other with great rapidity. The material to be reduced is introduced at the centre, and, by the operation of centrifugal force, is dashed from beater to beater until it becomes powder. The Tuckingmill Foundry Company show a working model of Borlase's patent ore-dressing machine, now at work at North Roskear, and recently described in these columns. It received no more than its deserts in being awarded a first silver medal. The Burleigh rock drill is exhibited by Messrs. C. Ball and Co., and has been well tested. To it the highest distinction in the power of the society has been given—the first silver medal.

A foretaste of what is to be expected next year, when the Institution of Mechanical Engineers and the Polytechnic Society unite their exhibitive forces, has been supplied already. Not only has the institution forwarded several interesting articles, including a series of machine-made gun-stocks, but Mr. Scott, one of their body, has among other inventions an improved apparatus for mine ventilation, which dispenses not only with furnaces, but with fans and all similar mechanical means. A jet of steam at high-pressure is driven along the air-channel, near its exit; driving the air before it, it causes a partial vacuum, and the rush of the air behind to supply the vacancy sets the whole body in motion. In the model a jet 1-64th of an inch in diameter was sufficient to create a draught of remarkable strength, the effect being almost instantaneous. Mr. Scott is now fixing an apparatus which is to supply 80,000 cubic feet per minute. Though specially adapted for coal mines, there is no reason why this system may not partially, at least, be adopted in metalliferous mines likewise; and in making their award the judges gave Mr. Scott the option of a first silver medal, or of the 10l. ventilation prize; he chose the former. To his wheel-moulding apparatus a second silver medal was awarded, and his pitching staff was highly commended.

A contrivance for raising or lowering miners, sent by Mr. W. Warren, of Durham, is ingenious, but hardly practical. It consists of an endless ladder, on which the miner takes his place, and is carried—on one side up, on the other down.

A capital furnace by Thomas Fletcher gained a silver medal. It is heated by gas, is capable of melting cast-iron, and could be used as an ordinary dining-table, occupying no more space than a dinner-party. For chemists and assistants such an assistant is invaluable. The "Little Rapid" sewing machine took first prize. In the statistical department a valuable paper is contributed by Mr. R. N. Worth, "Historical Notes Concerning the Progress of Mining Skill in Cornwall and Devon," which supplies a record of the various local stages of development in every department of mining, with citations from authorities.

The illustrations of workmanship, as exhibited chiefly in models of engines, are of unusual merit. A magnificent working model is shown of a Cornish pumping engine, made at the Perran Foundry for the College of Science, Dublin; and prizes for workmanship, &c., are awarded to Messrs. T. S. Gissing, J. J. Carr, J. Williams, J. P. Letcher, and E. Opie. For sections of South Corn Brea, North Wheal Bassett, Wheal Bassett, and South Wheal Bassett, Capt. John Maynard gets a special prize of 25l. The book prize offered by the Editor of the *Mining Journal* falls to R. H. Tregear, for a drawing of a double-acting steam engine. For a drawing and description of a steam-stamp, invented by T. H. Williams, 1l. is given; and for other drawings, E. F. Butler and J. Biddick each get 10s. Other awards to be mentioned here are Heywood and Tyler's universal pump, first silver medal; T. S. Gissing improved link motion, first bronze medal; Shute's patent hand-mitring machine, second bronze; Giles's hand-gravel-pitch and seed-sower, second silver; Foster's patent pressure gauge, Ernest Spon, 1st bronze; Fletcher's patent rhyssimeter; Bellows's wages calculator, first bronze; J. Martin, inland work, first prize; the Piston Freezing Machine Company's refrigerators, first bronze; Parker and Smith's laminated double-acting engine, first prize; and John Phillips and Co., of Newry, for a fine collection of their own makes in architectural pottery, the same. Capt. W. Oates sends a curious collection of old tools for ancient workings in Wheal Cook.

The exhibition was formally opened on Wednesday, by an address from the President, Mr. Charles Fox. The Baron and Baroness Rothschild, Mr. A. P. Vivian, M.P., and Mr. Bassett, M.P., were among those present.

On the following day (Thursday) the annual meeting of the Miners' Association was held, under the presidency of Mr. Bassett, of Tehidy. There was a good muster, and some excellent papers were read and remarks made. Particular attention was called by Mr. J. H. Collins, F.G.S. (who fills the double office of secretary to the Polytechnic and lecturer and assistant secretary to the Association with equal and indefatigable zeal, and to whom much of the success of the present exhibition must be ascribed), to the chief articles of mining interest in the hall.

Mr. T. B. JORDAN communicated the results of recent investigations concerning rock-boring in Prussia, which country the author had just visited on behalf of Messrs. Taylor and Sons. His principal object was to report on the boring machine of Sach. When he first saw it at the factory the requisite pressure (30 lbs.) was got up in the air-holder in a few minutes, and the machine started at the rate of 400 blows per minute, with a mean force of 70 lb. per blow. Holes (1½ in.) were sunk in a block of hard sandstone at the rate of 4½ in. per minute. He next visited Mechernich Mine. Here the condensing-engine and air reservoirs were at a distance of 950 ft. from the working end of the level, and he was informed that pipes 1½ in. in diameter were sufficient for 1000 ft. in length. The rock is hard sandstone, and a hole 2½ in. deep was bored, and all the required changes and adjustments made, in 15 minutes. The result was that a level 6 ft. wide and 7 ft. 6 in. high was advanced at the rate of 6 ft. 5 in. every 24 hours by three men. To do this 60 holes were bored. The explosive material used was dynamite. The holes were bored six in a set, charged together, but fired one at a time only. The borers if used by hand would sink 4½ in. in an hour sharpening; on the machine 26 to 33 in. The wages cost was a fraction over 2s. 6d. per yard. A careful consideration of these facts, together with the knowledge that Sach's machine was in use in 30 different mines and quarries, led Mr. Jordan to the conclusion that it was a practical success, and could be put into the hands of intelligent and instructed miners. The present cost of two boring-machines and plant was 750l., but he anticipated a saving of nearly one-half that amount could be effected, and the compressing apparatus utilised also in other directions. For comparison he stated that at Wheal Friendship, in June, a level was driven 36 ft. 6 in., at a cost of 39l. 1s. 8d. In 24 days, at Mechernich, the machine advanced the level 154 ft., at a cost of 51l. 6s. 11d., showing a saving of 5s. per fathom by using machinery and dynamite.

Other papers were contributed by Messrs. Willoughby—A Description of their New Stamps; Mineral Waters at Wheal Seton, Mr. Tilly; Carbonas, Mr. C. Fox; Rock-Boring in Hooac Tunnel, Capt. Tonkin; and the finding of a Road in Constantine Iron Mine, Capt. Noble.

IMPROVED BLASTING CARTRIDGE.—Mr. T. Klerity, the eminent Serbian mining engineer, has lately invented an improved blasting cartridge, which is said to save much powder or dynamite, and seems to be worth a trial. The new feature of it consists of a cast-steel cylinder, which is inserted in the cartridge, and replaces a part of the powder, which is ignited through a touch-hole in the cylinder. At both ends of the cylinder it is very nearly the calibre of the bore-hole, but its middle part, for about two-thirds of the whole length, is reduced to half that diameter. This part has a channel bored through it at right angles to the axis, while another vertical channel follows the axis from the top until it reaches the transverse passage, both of which are filled with fine-grained powder, and ignited



Aug. 17.—I beg to bid you my report of the progress made in the above mine. About the middle of May last operations were commenced, and up to the present everything has gone on most successfully. Our first charge was to overhaul the engine and engine-house, both of which we found required repairs. Tenders were asked for from the different tradesmen in the neighbourhood, which were received, and contracts let. The work was proceeded with, and duly completed. The engine which you have bought is an excellent piece of machinery, and one of the most



compact in the neighbourhood, and is at present quite equal to new, and would doubtless, if offered for sale, realise three times the amount given for it. The boiler I have had examined by Messrs. Batcliffe and Son, who are professional makers, and also by two engineers from the district, all of whom pronounce it to be in excellent working order. We did not succeed in securing second-hand pumpwork by advertisement, and it has been obtained with the greatest difficulty, and but for the judicious purchases made during your secretary's visit, many things at one-fourth the cost price, we should have had to get all new from the foundry. The whole of the pitwork is of the mine, with the exception of about 20 yards of 12 in. pump-trees, which I expect to arrive from St. Helen's every day. I have the pitwork arranged in the engine-shaft as deep as we can get—80 yards from surface. The bottom part is 26 yards below the surface of the water; we believe that the end, or nose, of it is in the old cistern at the 80, and until the water is out we cannot get any deeper; at present the lift is resting on strong oak or pitch-pine bearers. We have the main-rod from the end of the beam down in the shaft as far as required for the present, with stays and foot-locks fixed to the same. The top lift is a drawing lift, and connected to the main-rod by what is called a set-off. This arrangement is simply temporary, for as soon as the water is sufficiently low we shall convert it into a "plunger," and at once commence to carry down our bottom lift. We have the engine-shaft properly cased or divided from surface to the top of the water, also some good and substantial ladders fixed. I have also to inform you that we have been very successful in purchasing a first-class pair of shear-legs, capstan, and pulleys at most reasonable prices, all of which are fixed, and in their places, the whole of the above having been carried out and completed, together with sundry other works, which are to numerous to mention. On Wednesday evening last we started the engine, which, as a preliminary trial, went off very satisfactorily. We found that we had to make two or three alterations, but are pleased to inform you that I now saw an engine work better. The water was soon brought to surface, and in less than an hour we had lowered the same in the engine-shaft  $4\frac{1}{2}$  yards, but in consequence of the clock becoming chipped the engine had to be stopped, and a temporary drop-check ordered from the foundry, which we have received, fixed, and worked, and are doing well. The engine is pumping a river of water, and will very soon have it all out. I think that you will agree with me that the trial made, although small, to fork  $4\frac{1}{2}$  yards in one hour is a sufficient proof of our being able to keep the water under with the greatest ease. As to our future prospects, I must refer you to my report which accompanied the prospectus, and the more I study the position of the mine, and taking into consideration the great value and importance of the additional land which your secretary has secured and added to your "take," the more convinced I am that you have a great mine in the Denbighshire Consols. I have to-day been through a great part of the old workings, which are very extensive, and never in my experience have seen a more promising lode. There is not the slightest doubt in my mind that as soon as the water is out, and the 113 yard level extended east and west a few fathoms, and the engine-shaft sunk a little deeper, the success which I anticipated will be fully realised. The present workings are evidently too short to catch the run of ore coming down from the upper workings. The new shaft in Colomandy Park is a most splendid trial, and spoken of in the highest degree by all practical miners. It is now down 10 yards from surface; the ground is most favourable, both for sinking and for the production of ore. I am very sanguine as to this part of the mine, and look forward to great results from it, and should recommend you pushing down the shaft as rapidly as possible to where lode was left by the former workers. The weather is fine and dry, and now is the time.

The CHAIRMAN said this meeting had been called pursuant to the provisions of the Companies Act, which provided that the shareholders meet within four months of the registration. Although so short a time has elapsed, a great deal of important work had been done at the mine preparatory to the production of ore, which there was every reason to expect would result almost immediately the engine had thoroughly forked the mine. The directors not only had great confidence in Capt. Pryor, but were perfectly satisfied with the energy and ability he had displayed. He then moved that the report be received and adopted.

Mr. DUCK seconded the proposition. He had much pleasure in adding his testimony to the zeal and judgment displayed by Capt. Pryor, and also by their worthy secretary, in bringing out the company. He never anticipated so much work could have been done in so short a time; there had not been a single accident, although difficulties had been encountered and overcome.

Mr. BARTLETT mentioned that a telegram had been received within an hour of the meeting, announcing that at three o'clock that morning the mine was in fork, and the engine working only two strokes per minute, which was a complete answer to the power of the engine being equal to all requirements. During the four months all the preliminary work had been done, which would have taken many men double that time to complete, so that Captain Pryor was unquestionably entitled to their warmest praises.

The CHAIRMAN mentioned that the 346 shares would be offered *pro rata* to the shareholders, and although applications should be sent in within a fortnight payment would not be required immediately, so as not to put any pressure upon the shareholders.

Mr. BARTLETT said that a sale of these 346 shares would place the board in possession of more capital than it was estimated would be required to place the mine in a proper position. He might add that the additional piece of ground, which he had been able to secure for a very nominal sum, could not fail to be of value to the company.

Mr. HERBERT DUKE, as a large shareholder, expressed, from a personal inspection of the mine, his perfect satisfaction with its value and prospects, and also with the large amount of work done in so short a time. He had full faith in all Capt. Pryor said and did. The shareholders were much indebted to the Chairman and directors for the energy they had displayed, and also to the secretary. As a large shareholder, he was quite content to leave his interest to their control, and willing to take his proportion of the new shares about to be issued.

Mr. BARTLETT said that when this mine was brought out, he resolved to have as much work done as possible in a comparatively short time, feeling that was the true principle to be adopted to ensure success.

The report was adopted, and a vote of thanks to the Chairman, directors, and secretary terminated the proceedings.

#### WHEEL BULLER MINING COMPANY.

A general meeting of shareholders was held at the account-house, on the mine, on Aug. 20.

Mr. THOMAS PRYOR (the purser) in the chair. The notice convening the meeting having been read, the PURSER read the statement of accounts for four months to end of June last, which showed—

Balance from last account	£ 794	6	3
Labour cost for four months to end of June	1877	9	1
Merchants' bills to end of June	1012	8	
Bankers' charges	6	12	8
Discount on calls	40	11	0
Lords' dues	39	6	7 = £3770 18 11
Call made, April 17	£1024	0	0
Black tin sold	1109	8	7
Copper ore	587	3	11
Old iron, &c.	47	10	0 = £2768 2 4
Balance against the mine of	£1002	16	7

The PURSER said that at their last meeting it was generally believed that at the present account they would be in a much better position than their accounts showed to day; but this was owing, as he had said on one or two other occasions, to the unusual high prices they had had to pay for their materials, such as coal, iron, &c., and also the great rise that had taken place in the price of labour. This they had an control over, but he believed, from the information he had gathered, that materials had gone to their highest, and that they had every reason to expect, not only that the price of coal and iron would be lower, but that the miners, too, would be more plentiful, and they would have to do more work for their money. (Hear, hear.) He should be happy to reply to any question any proprietor had to make about the accounts, and was sure the agents, who were present, would also be happy to reply to any enquiries about the mine. The shareholders would see that the calls had been well responded to, the arrears being only 48s., as shown in the balance sheet, and out of this he had that morning received 8s., so that the arrears really were only 40s., all of which was good. This amount was owing on the last call; and when they considered that they had called up such a large sum during the last few years, he thought that everyone present would agree with him that they had in Wheel Buller a list of shareholders that could not be surpassed in the county. (Cheers.)

Mr. TREGONING (Cambridge) said he quite agreed with their purser that they had every reason to congratulate themselves that their calls had been so well responded to, but from what he had said day seen he could not help saying, if indications went like that they had an control over, but he believed, from the information he had gathered, that materials had gone to their highest, and that they had every reason to expect, not only that the price of coal and iron would be lower, but that the miners, too, would be more plentiful, and they would have to do more work for their money. (Hear, hear.) He should be happy to reply to any question any proprietor had to make about the accounts, and was sure the agents, who were present, would also be happy to reply to any enquiries about the mine. The shareholders would see that the calls had been well responded to, the arrears being only 48s., as shown in the balance sheet, and out of this he had that morning received 8s., so that the arrears really were only 40s., all of which was good. This amount was owing on the last call; and when they considered that they had called up such a large sum during the last few years, he thought that everyone present would agree with him that they had in Wheel Buller a list of shareholders that could not be surpassed in the county. (Cheers.)

Mr. PEACOCK said he had, as most of them knew, been in the habit of attending most mine meetings in the county for many years past, and he must say that their officials deserved great credit for the way they had placed matters before them that day. He thought that it would be an advantage if pursers would generally adopt the principle of placing on the table the receipts and the bankers' pass-book, with the other books of the company, as had been done that day. (Hear, hear.)

The agents' report was then read, which was considered a very satisfactory one. Several shareholders having expressed themselves pleased with the improved prospects of the mine, the accounts and report were unanimously adopted, and a call of 2s. per share was made, and if paid on or before Thursday, Sept. 5 next, a discount of 1s. per cent be allowed on the same.

The PURSER said the next question they had to discuss was one, he thought, of great importance to the miners employed in the mine—he meant the appointment of the doctors. At the last meeting the men expressed a wish to select their own surgeons, he then told them that they, as agents, had no possible objection to this being done, but that he would bring the whole matter before the shareholders at their next meeting. He really thought that when any man paid for medical advice he ought to have the man of his choice, and that the question of doctors was, after all, a miners' question; he should, however, be glad to hear the views of the shareholders on this matter.—Messrs. Martin, Mitchell, Kneebone, and other shareholders having expressed themselves in favour of the men's proposition, the following resolution was proposed, seconded, and carried unanimously, viz.:—

"That, in compliance with the wishes of the men, they be allowed in future to select their own doctors, and that the present appointments of the surgeons of the mine be cancelled."

The CHAIRMAN said that he regretted to have to bring before the shareholders another matter, which had reference to an old member of their staff. He referred to Capt. Inch, who had been in the mine from its commencement, but who was now, and had been for some time, out of health, and unable to attend to his underground duties. Although Capt. Inch was unable to go underground he would be able to attend to the assaying of the mine, and to other surface work, and he should much like to see him appointed in the future. Capt. Inch had thought of retiring altogether, but he thought if he was appointed in the capacity referred to the shareholders generally would be benefited thereby, as they would then have his advice and the benefit of his great experience in the district. (Hear, hear.)

Mr. PEACOCK said they all sympathised with Capt. Inch, and he thought the suggestion of their purser a good one.—This was also confirmed by several other

shareholders, and ultimately the following resolution was unanimously passed, viz.:—"That, in consequence of the failing health of Capt. Inch, and of his being unable to attend to the underground work of the mine—resolved that he be appointed to assay the samples of the mine, and to attend to other surface work, at a salary of £1. 6s. per month."

Capt. Inch said he was very much obliged to the shareholders for the way they had treated him, and also to Mr. Pryor for the very kind way he had spoken of him, and for the manner he had brought the subject before them. It was quite true he was, and had been for some time, out of health, and the last time he was underground he thought he should never come up again. He believed that it would prolong his life for many years by what they had done that day. He had been in the mine from its commencement, and he must say that he was now much pleased with the general prospect of their property. He recollected very well when they first cut their ore in Whitford's shaft, and if they did not shortly meet with a good lode in their new shaft he should be very much mistaken. They were now down about the same distance as when they first met with their great deposit of copper; and as their indications in their new shaft were everything that a practical miner could wish, and seeing that this lode was exactly parallel with their former rich lode, and also with the rich lode they had in East Bassett, he had every confidence that the shareholders would before long have reason to congratulate themselves for having commenced this shaft. Although he was unable to go underground he should at all times be happy to render Capt. Charles Thomas, their agent, every assistance in his power. (Cheers.)

The CHAIRMAN said it must be gratifying to hear Capt. Inch speak in such terms, and he hoped that, although he was at present unable to go underground, he would by-and-by be in a better state, and would be able to see the good things he had been prophesying in the new shaft. They all knew they had a capital agent in Capt. Charles Thomas, who was brought up in the same practical school as his able cousins at Dolcoath and Cook's Kitchen; and, as he would have additional work to do, he thought they would only be doing an act of justice to Captain Thomas by giving him an extra guinea per month, as he knew that he had recently refused a good appointment in the district at 10s. 10s. per month. Mr. Richard said they had effected a saving of 3s. 3s. per month by the partial retirement of Capt. Inch, and as Capt. Thomas would have additional work devolving on him he should propose that he have an extra 2s. 2s. per month, which would then effect a saving of 1s. 1s.

This was seconded and carried unanimously.

Capt. THOMAS said he was much obliged to the shareholders. It was quite true he had recently refused an appointment in a dividend mine in the district, but he had confidence in Wheel Buller and in the company; and if hard work and perseverance would make a good mine they might rest assured it would not be wanting on his part to accomplish it.

The meeting then separated with the usual compliments.

#### WHEEL KITTY (ST. AGNES) MINING COMPANY.

The quarterly general meeting of shareholders was held at the account-house on the mine, on Thursday, the 15th inst.,

Mr. WILLIAM TREGAY in the chair.

Mr. MICKEY (secretary) read the notice convening the meeting, and the minutes of the last were confirmed.

The financial statement for three months—April, May, June—showed a profit on the quarter of 2221s. 19s. 4d., and a balance in favour of the mine of 2664s. 9s. 11d.

The report of the agents was read, as follows:—

Aug. 15.—The new shaft is being sunk 2 fms. under the 130; this sinking will be pushed on with all possible speed, in order to get to the 142 as quickly as possible; we do not expect to see the lode before this level is reached, the shaft being sunk off the lode for convenience. In the 130, driving west of new shaft, the lode is worth for tin 12s. per fathom. In the 130, driving east of new shaft, the lode is worth for tin 15s. per fathom. In the 118, driving west of new shaft, the lode is worth for tin 12s. per fathom. In the 118, driving east of new shaft, the lode is yielding saving work for tin. In the 108, west of new shaft, the lode is worth for tin 14s. per fathom. In the 94, driving west of new shaft, the lode is worth for tin 12s. per fm. In the 82, driving west of new shaft, the lode is worth for tin 9s. per fathom. In the rise in the 34, east of new shaft, the lode is worth for tin 6s. per fathom.—Old Lode: In the 90, driving east of engine-shaft, the lode is worth for tin 7s. per fm. In the 80, driving east of engine-shaft, the lode is worth for tin 7s. per fm. In the 70, driving east of engine-shaft, the lode is worth for tin 7s. per fm. We hope to continue to raise about our usual quantities of mineral for the future.—W. TREGAY, S. DAVEY, J. WILLIAMS.

The CHAIRMAN was pleased to be able to submit so satisfactory a statement. It would be seen that during the quarter they had sold 53½ tons of tin, which left a profit of 2221s. 19s. 4d.; this would enable them to give a dividend and bonus, equal to that of last meeting, and carry forward an increased balance.

It was then resolved that a dividend of 7s. 6s., together with a bonus of 2s. 6s. per share, be now and is hereby declared payable forthwith.

A vote of thanks was accorded to the Chairman.

#### EAST TRELEIGH WOOD MINING COMPANY.

The second meeting of this company was held at the mine, on Wednesday, and was very numerously attended.

Capt. WILLIAM TREGAY in the chair.

The CHAIRMAN read the notice convening the meeting, and the minutes of the former one, which were confirmed. The statement of accounts showed an expenditure to the end of July of 348s. 12s. 3d., and a cash balance in hand of 2651s. 7s. 9d. carried to the credit of the company. The report of the managers, Messrs. Lean, Jose, and Co., and of the agent, Capt. Leonard Tregay, was then read:—

Aug. 20.—Since the shareholders met, on May 3 last, we have cleared the footway shaft on Cardew lode, which is now open to the water within 5 fms. to the deep adit. Coloured up a shaft on the boundary of the two mines between the East and West Treleigh Woods, since which time the Wheel Boys' adventures have erected a horse-whim tier, which as yet has been used only by us for drawing attle and tin stuff from the intermediate level, called the 12 fm. level, between the shallow and deep adits. We have collared up and cleared the eastern footway shaft, on Prussia lode, about 20 fms. from the boundary, from surface to the deep adit. Coloured and cleared two shafts on Prussia lode, to the bottom of the old workings, about the middle of the sett, and effected other preparatory work necessary to the proper development of the mine west of the cross-course. We find the Prussia lode, at the eastern shaft cleared, has been worked by the old men 20 fms. deep from surface, from which we got pretty good quantities of tin. The lode has a hard capel—it is not yet cut into by us, and if worked by the ancients, we have not yet seen their workings therein. We, however, believe that all these divisions, or branches, are part and parcel of the same lode, divided close to the surface, and uniting as they go down; because the north part is underlaying south at a considerably more rapid rate than either of the other parts. The Treleigh Wood lode, which runs through the south part of this sett, has not yet been opened on, for obvious reasons. First, in the deep adit, wherein we have strong reason to expect finding it pretty quickly as soon as that level is clear from the choke; then the south part of the lode is apparently altogether sufficient to render it a very safe operation for the men. As the water is daily getting lower we hope to attack this choke shortly, and to thoroughly open this level. As to continuing for it at surface, the season now passing has not been the most desirable for breaking the surface of cultivated land, and we shall find a more convenient season in the next three weeks. The course we recommend in the north part of the mine will be to sink the western shaft, on Prussia lode, as quickly as possible, to reach the junction of the lodes, or different parts of the lodes, when we may reasonably expect a very great improvement, and to bring home the deep adit under this point; and in the south part of the mine to open Treleigh Wood, clear the choke in the deep adit as soon as circumstances permit, and at the same time to coteast as soon as the land is open for that purpose in the western extremity of the sett. This will be making the most of the prospects of success before us, while we are looking out for a suitable engine for pumping out the mine. With regard to the prospects of success before us. We think now, as we considered from the first moment, the mine came under our notice, that we cannot anywhere find better, and the very good discovery already made in the north part seems to justify our adhering to that opinion.—LEAN, JOSE, and Co., managers, L. TREGAY, agent.

BEDFORD UNITED.—At a special meeting it was resolved to defer the consideration of placing the mine under the Limited Liability Act, and the question of raising further capital by the issue of new shares, as it was suggested that some other means might be adopted for raising the necessary capital for the further development of the valuable resources of the mine without resorting to the alteration of the constitution of the company. The accounts showed a cash balance in hand of 635s., but to meet outstanding liabilities it was resolved to make a call of 2s. 6s. per share. Capt. Phillips reported favourably on the various points of the mine, especially on the discovery at the 115 fm. level and the winze in the 75 fm. level east.

CHESHIRE AMALGAMATED SALTWORKS.—The annual meeting was held on Tuesday, at the offices in Finsbury-place—Mr. C. Kay in the chair. A dividend of 10s. per share was declared, and 5002s. 3s. 7d. carried to the credit of next year's account. A cordial vote of thanks was given to the directors for their successful management of the company's affairs during the past year.

BALMYNIEAR.—At a meeting on Aug. 14 the accounts showed a debit balance of 75s. 4s. 9d. Capt. John Tonkin and J. S. Harris said:—"Looking at the mine as a whole, we believe we are opening a good mine, that will, with a little more patience and perseverance, pay you well for your outlay. We are raising at present about 7 tons of tin per month, and expect to do so, unless the value of the ground falls off, until the new engine is set to work, when the whole of the power of the present engine will be applied to stamping, and nearly double the quantity of stuff may be stamped."

SOUTH FOWEY CONSOLS.—At the meeting on Aug. 15 (Mr. B. C. Gidley in the chair) the accounts from October, 1871, to June 8 last, showed a debit balance of 1192s. 11s. 11d. A call of 6s. per share was made. The directors' report stated that the arrangement with Mr. Preston to place relinquished and other shares at 5s. per share was not successful; he placed but 42 shares; those the directors ordered to be registered. In consideration of Mr. Preston's large outlay in attempting to place the shares, he was granted the option of taking 200 of the remaining (60000s.) shares at 5s. per share, and it was hoped by this means to introduce new shareholders, and a little fresh energy into the shareholders. Mr. Wm. Polkinghorne has been repaid in full the various claims of operation. From the exceedingly kindly character of one of the south lodes westward for the production of tin, they are confident if the different lodes are fully developed of its opening out a lasting mine, and also a profitable one to the shareholders.

[For remainder of Meetings see to-day's Journal.]

#### FOREIGN MINING AND METALLURGY.

There has been no change in the condition of the French iron trade, and there is, in consequence, no notable variation to report in prices. Working operations are being energetically pushed forward. Northern of France Railway Company has obtained official authority to lay down a somewhat lighter description of steel rails upon its system,—that is, the weight of the new steel rails employed will be less than that of the old iron rails hitherto used. The Paris, Lyons, and Mediterranean Railway Company has, however, determined to replace its iron rails with steel rails of the same weight. It is stated that a group of Belgian financiers and commercial men have offered 2,000,000l. for the acquisition *en bloc* of all the old metal-pig and iron—in the French arsenals. The report requires, however, confirmation.

There is no material variation to report in the price of iron in Belgium. Quotations remain fixed at their former level, but much higher rates are sometimes introduced into contracts. Plates have been dealt in at 16s. per ton for No. 2; No. 1 rolled iron has been held at 11s. 4s.; and refining pig has been supported with firmness at 4s. 16s. per ton, and has even attempted a quotation of 5s. 4s. per ton. The demand for Belgian iron on foreign account continues heavy. Several English establishments are credited with an intention to establish branches in Belgium, and the German demand also steadily increases. Rails are in demand on all sides, but the Belgian rolling mills can accept very few orders. Two blast-furnaces have been re-lighted in the central district, but, on the other hand, one has been blown out. MM. Michel Helsen and Co. are expected to bring a blast-furnace into working this week at Hautmont; the erection of this furnace was only commenced in March, so that no time has been lost about it. The imports of iron of various kinds into Belgium in the first five months of this year amounted to 58,000 tons, as compared with 29,000 tons in the corresponding period of 1871. The exports of iron of various kinds from Belgium in the first five months of this year were 12,500 tons, against 2800 tons; and those to the United States 9500 tons against 3600 tons.

There has been comparatively little business passing in copper in France, and the article is falling. At Paris copper in bars, delivered at Havre, has brought 104s. per ton; ditto ingots and tough English, 108s. per ton; and Corocoro minerals, pure standard, 110s. per ton. In Germany the state of affairs has not experienced much change, the tone of the markets remains good, upon the whole, but prices have slightly given way. At Rotterdam, Russian copper has been quoted at 51s. 1d., and Drontheim at 52s. 1d. to 53s. 1d. Tin has been very feeble upon the French markets. At Paris, Banca delivered at Havre or Paris has made 172s.; Straits ditto, 164s.; and English delivered at Havre, Paris, or Rouen, 162s. per ton. The Havre market has remained without change. There has been no important modification to notice upon the German markets. Tin has been somewhat feeble at Rotterdam. Transactions in Banca have taken place at 94½d., while disposable Billiton has realised 97½d. Lead has been very firm upon the French markets. French lead delivered at Paris has brought 21s. 4s.; Spanish delivered at Havre, 20s. 16s.; English ditto, 20s. 12s. per ton. Belgian and German lead have made default at Paris. At Marseilles first fusion sumons have realised 19s. 4s.; and second fusion sumons, 18s. 18s. per ton. There has been no material change in lead upon the German markets. At Rotterdam, Spanish lead has been quoted at 12½d., Stolberg at 12½d., and German of various marks at 12½d. At Paris, Silesian zinc delivered at Havre has realised 24s. per ton; other good marks delivered at Paris have made 24s. per ton. Some considerable transactions in zinc are reported at Breslau.

Anticipating transport difficulties in the winter months, French industrialists are now endeavouring to lay in as large stocks as they can, a circumstance which tends, of course, to maintain, and even enhance, the price of coal upon the French markets. Several new shafts are about to be sunk in the Nord and the Pas-de-Calais, where recent soundings have made known a fresh group of workable beds. The French Minister of Public Works has been authorised to accept, in the name of the State, an offer made by the Council-General of the department of Meurthe-et-Moselle to advance to the State a sum of 84,000l., in order to assure the execution of works for the canalisation of the Moselle between Toul and Port St. Vincent. The department of Meurthe-et-Moselle has been further authorised to raise the 84,000l. in question by a loan, to bear an interest not exceeding 6 per cent. per annum.

There is no very extraordinary circumstance to note in connection with the Belgian coal trade. The markets maintain the same activity, and prices have risen rather sensibly. Railway traffic has been conducted pretty well of late, the supply of trucks being nearly equal to the business which they have to accommodate. The imports of coal into Belgium in the first five months of this year amounted to 87,000 tons, as compared with 78,000 tons in the corresponding period of 1871; the augmentation arose wholly in the imports from France. The exports of coal from Belgium in the first five months of this year amounted to 1,851,000 tons, against 1,056,000 tons in the corresponding period of 1871. The exports declined to the Zollverein and the Low Countries, but they increased to France in the first five months of this year to 1,708,000 tons, as compared with 874,000 tons in the corresponding period of 1871. The great dearth of English coal occasioned this very considerable augmentation in the French demand for Belgian coal this year; account must also be taken, of course, of the revival which has taken place in French manufacturing industry during the last few months. The exports of coal from Belgium in the first five months of this year were 318,000 tons, as compared with 154,000 tons in the corresponding period of 1871. In the increase of 160,000 tons observable in this year's figures France figured for 100,000 tons, and the Zollverein for 60,000 tons.

#### MINING IN NEVADA.

##### THE RICHMOND CONSOLIDATED MINING COMPANY.

This company are owners of the Richmond, Colorado, Virginia, and Tip Top Mines—all in Ruby Hill, about two miles in a westerly direction from the town of Eureka. The smelting works of the company are situated in the southern end of the town, upon the site of the reduction works of the old Richmond Mining Company. Prof. R. A. Fisher (formerly of the University of California) assumed the management upon transfer of the property to the present owners, and immediately commenced opening up the mine on an extensive scale, and enlarging and improving the smelting works. These are now, in respect to the facilities for handling ore and charcoal by a complete system of railways and other arrangements for saving labour, and above all preserving the health of the workmen, the model smelting works of the Pacific Coast. One of the most valuable of the improvements referred to is the—

UTILISATION OF THE WASTE WIND.—By a most simple contrivance, the wind can be partially or entirely turned from the interior of the furnace and made to pass through a series of pipes placed outside the furnace and under a hood that completely surrounds it, and thence up the ventilating shaft in front of the furnace. During the process of barring out, all the wind thrown by a No. 88-ventilator blower passes through the ventilating shaft, and the result is that the workmen at the Richmond furnace are no longer "leaded" (poisoned by lead fumes). The universal adoption of Prof. Fisher's system must be only a question of time at any lead smelting works where the health of the workmen is at all considered. Another valuable invention of Prof. Fisher is a very simple contrivance for detecting a leaky tuyere. Tuyeres often burn out or spring a leak, and the result is that a stream of water is poured into the furnace. Hitherto the only method by which to discover a leaky tuyere was by removing tuyere after tuyere from the furnace, until the imperfect one was discovered. By this invention every tuyere in a furnace can be perfectly tested in a few minutes. There is but one furnace now running at the Richmond reduction works, but this is of a monster size. It has melted 70 tons of ore in 24 hours. It reduces on an average about 2000 tons per month. A furnace of still greater capacity is now in progress of rapid construction. It was informed that the expense of reducing ore at the Richmond furnace, according to last report made to the board of directors was \$13.02 per ton, against \$10.12 per ton—the cost of reducing 18-325 tons at the smelting works of the Eureka Consolidated Mining Company's furnace—\$8.10 per ton. A nice little dividend on 2000 tons per month.

The question of supplies of fuel will be a serious one in the future with the smelters of Eureka district. The manager of the Richmond, seems to have taken time by the forelock. The charcoal bins of the company have a capacity of about 300,000 bushels, and are already about half full. We were informed that on or before Dec. 1, the bins (notwithstanding the enormous monthly consumption of charcoal) would be filled—to furnish a supply for the six months following. Such an amount of money locked up in charcoal requires precautionary measures against fire. These are abundant at the Richmond furnace. A wooden tank holding 16,000 gallons, stands (filled with water) upon the hill side, elevated 100 feet above the furnace floor and a second tank (entirely built of stone), holding 11,000 gallons, at a less elevation, supplies the tuyeres with water. A 12-inch Cameron steam-pump, placed in the well 30 feet below the surface, furnishes a most abundant supply of water as clear



**KAOLIN.**—From Australia we learn that 50 tons of Kaolin were raised in that colony during the year 1871.

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It is rapidly making its way to all parts of the globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States and England. Read extracts of testimonials:—

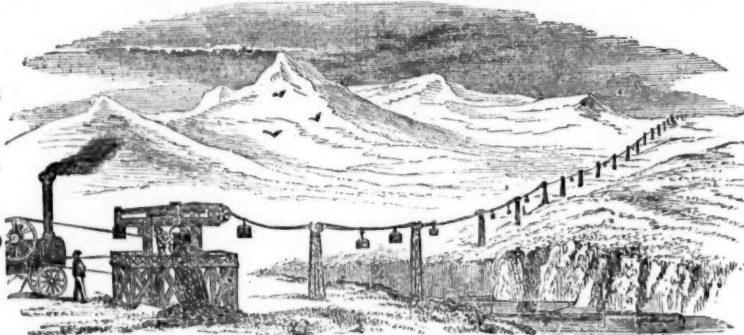


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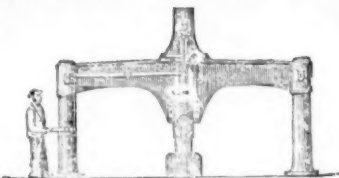
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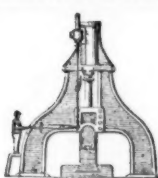
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STEAM HAMMERS AND STEAM STAMPS MAY ALWAYS BE SEEN AT WORK.

The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had one of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.

For the Parys Mining Company, H. R. Marsden, Esq. JAMES WILLIAMS.

The Van Mining Company (Limited), Van Mines, Llanidloes, Feb. 6, 1871.—Our machine, a 10 by 7, is now breaking 180 tons of stone for the crusher every 24 hours. I may say, of all our machinery, that for simplicity of construction and dispatch in their work, they are equal to anything in the kingdom, but your stone breaker surpasses them all. W. WILLIAMS.

H. R. Marsden, Esq., Leeds.

Chacewater, Cornwall, Jan. 27, 1869.—I have great pleasure in stating that the patent stone breaker I bought of you some three years ago for mines in Chili, continues to do its work well, and gives great satisfaction. It crushes the hardest copper ore stone—put it through ¼ inch size by horse power—with great ease. I can safely recommend it to all in want of a crusher; can be driven by steam, water, or horse power. H. R. Marsden, Esq. JAMES PHILLIPS.

Terras Tin Mining Co. (Limited), near Gram-pound Road, Cornwall, Jan. 1871.—Blake's patent stone crusher, supplied by you to this company, is a fascination—the wonder and admiration of the neighbourhood. Its simplicity is also surprising. Persons visiting it when not at work have been heard to remark, "This can't be all of the machine." It will crush to a small size from 8 to 10 tons of very hard and tough elvan rock per hour; taking into its leviathan jaws pieces of the hardest rock, weighing 200 lbs. or more, masticating the same into small bits with as much apparent ease and pleasure as does a horse his mouthful of oats. On every 100 tons of the rock crushed by the machine there is a direct saving to the company of not less than £5 over the process of hand labour previously adopted by them, and the indirect saving much more, the machine being ever ready to perform the duties required of it. It breaks the stuff much smaller, and in form so fitted for the stamps, that they will pulverise one-third more in a given time than when performed by hand labour. JOSEPH GILBERT MARTIN.

H. R. Marsden, Esq., Leeds.

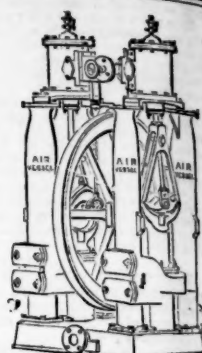
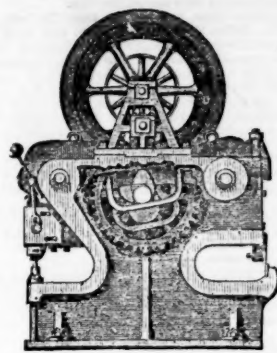
Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stones and quartz. WM. DANIEL.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or \$75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 101 tons of Spanish pyrites with it in seven hours. EDWARD AARON.

H. R. Marsden, Esq. Weston, near Runcorn.



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